MINERALS

ECONOMIC & REGIONAL DEVELOPMENT AGREEMENT

Sector A Geoscientific Activities Progress Report 1987·88

Canada

Manitoba

88-05805/

CANADA-MANITOBA MINERAL DEVELOPMENT AGREEMENT (MDA)

OFFICIALS 1987-88

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Cover photographs: Left: - Winter reconnaissance at Dead Horse Lake; upper right - Mapping volcanic structures at Flin Flon; lower right - Industrial Minerals drilling at Pipe Pit.

CANADA - MANITOBA

MINERAL DEVELOPMENT AGREEMENT

1984 - 89

SECTOR 'A' GEOSCIENTIFIC ACTIVITIES

PROGRESS REPORT 1987-88

Manitoba
Energy and Mines
Geological Services
Open File Report OF88-2

Frontispiece: Cobra drilling dolomite near Wekusko.

FOREWORD

This report chronicles the achievements of the Provincial and Federal Geological Surveys in the fourth year of cooperative programming mounted under Sector A of the Canada-Manitoba Mineral Development Agreement, a subsidiary agreement to the Economic and Regional Development Agreement (ERDA).

The report summarizes MDA-related geological investigations in Manitoba during the 12 month period ending March 31, 1988, and describes the rationale behind the work, the location and focus of activities, the agencies and individuals involved, and output that has been generated. As such the report constitutes an administratively oriented supplement to technical publications which are the principal product of the Surveys' work.

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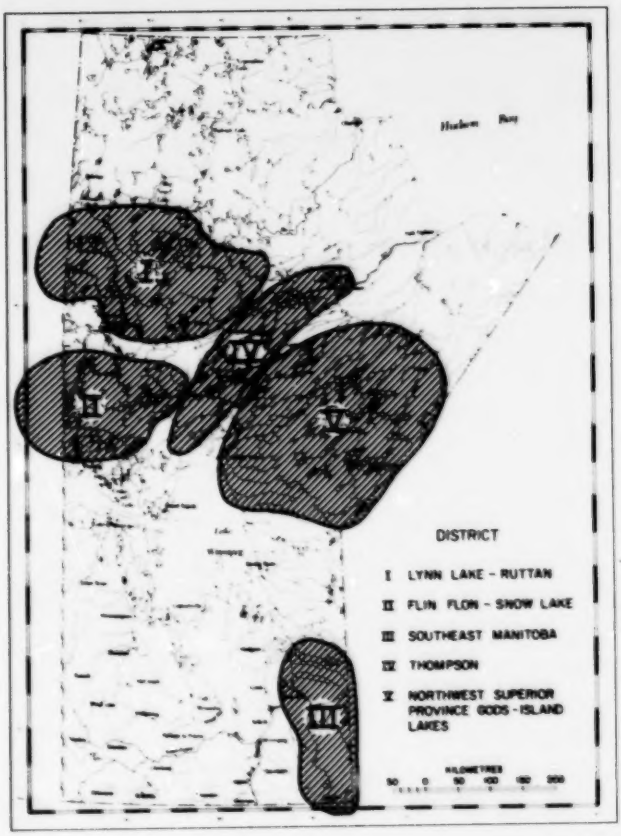


Figure 1a: *Canada-Manitoba Mineral Development Agreement: Focus of Sector A Geoscientific Activities.*

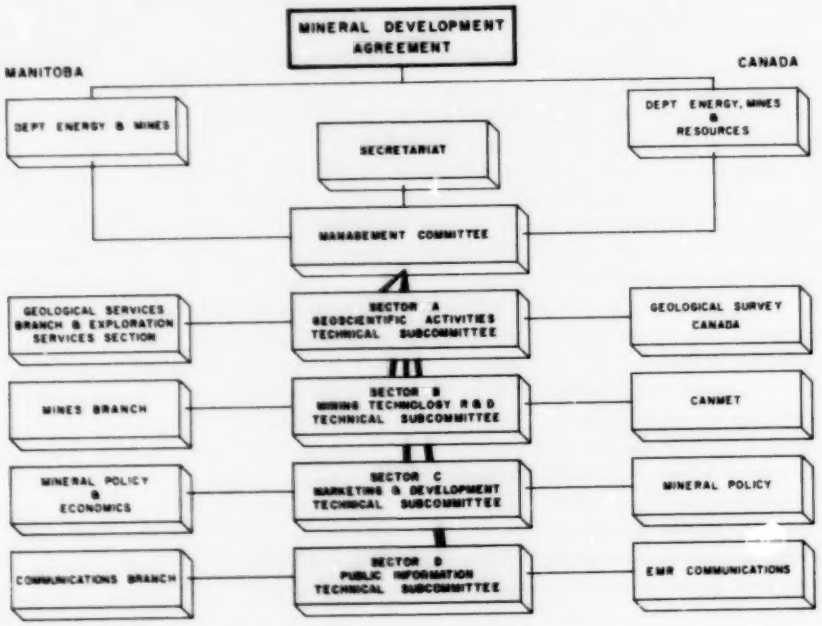


Figure 1b: *Federal-Provincial liaison network and government agencies contributing to programming under the Canada-Manitoba Mineral Development Agreement (1984-1989).*

I. CANADA-MANITOBA MINERAL DEVELOPMENT AGREEMENT 1984-89

BACKGROUND

The Canada-Manitoba Mineral Development Agreement is an important component in the Provincial and Federal governments' plan for stable and steady economic growth of the mineral industry in Manitoba. It also encompasses an all-embracing vision of Manitoba's future, a future in which the communities relying on the mineral industry will continue to grow and prosper.

On November 25, 1983 the Federal and Provincial cabinets approved both the umbrella Economic and Regional Development Agreement (ERDA) and the subsidiary Canada-Manitoba Mineral Development Agreement (MDA).

Under the five-year MDA (1984-89) the Federal and Provincial governments will contribute $14.8 million and $9.9 million, respectively for a total funding of $24.7 million.

The goals of the MDA are:

(a) to increase mineral exploration and the development of mineral resources in Manitoba, consistent with the broader joint planning underway through ERDA; (b) to assist in the more effective assessment and utilization of the province's mineral resources; and (c) to establish a framework for programs which will strengthen and diversify the mineral resource base of the provincial economy.

The MDA is designed to gather data, analyze, synthesize and disseminate information on the geology of Manitoba (with a special emphasis planned for the Lynn Lake/Ruttan and Flin Flon/Snow Lake Districts) (Fig. 1a). It is also intended to coordinate research on mineral processing, metallurgical technology and mining methods, and to conduct marketing and other economic studies.

Work under the Agreement is grouped into four sectors (Table 1): A - Geoscientific studies, B - Mining and mineral technology R and D; C - Development and Marketing studies; and D - Public information, evaluation and administration.

Sector A - Geoscientific activities (the subject of this Progress Report), are implemented by the Geological Survey of Canada (GSC) and the Manitoba Geological Services Branch (MGSB) together with research contributions contracted from universities.

Programs are organized into five categories: 1 - Precambrian Geological Investigations, 2 - Mineral Investigations, 3 - Geophysical Surveys, 4 - Geochemical Surveys, and 5 - Geological Compilations.

Workplans are developed each year by technical subcommittees (Fig. 1b) with industry input encouraged through a Mineral Exploration Liaison Committee (MELC) as well as through ongoing dialogue between government and industry geologists. The joint Federal/Provincial Workplan for 1987-88 was approved by the Management Committee to the Agreement at its meeting in Ottawa, on March 3, 1988, and copies distributed to MELC representatives.

TABLE 1.

CANADA-MANITOBA MINERAL DEVELOPMENT AGREEMENT
SCHEDULE "B"
Summary of Costs 1984-89
($000,000's)

Sector/Program/Project	Federal Share	Provincial Share	Total Costs 5-Years
SECTOR A			
GEOSCIENTIFIC ACTIVITIES			
Program 1. Precambrian Geological Investigations			
— Detailed geological mapping; drilling		1.1	1.1
— Regional geological models; drilling	0.9		0.9
Program 2. Minerals Investigations			
— Detailed metallic and industrial minerals studies; applied research		2.05	2.05
— Mineral deposit models	1.25		1.25
Program 3. Geophysical Surveys	2.45		2.45
Program 4. Geochemical Surveys and Glacial Prospecting			
— Regional geochemical surveys	2.05		2.05
— Quaternary geology surveys	0.85		0.85
— Detailed environmental geochemistry and glacial prospecting		0.25	0.25
Program 5. Geological Compilation			
— Various compilation and information outputs		1.6	1.6
— Quaternary geology atlas; data systems	0.5		0.5
Subtotal Sector A	8.0	5.0	13.0
SECTOR B			
RESEARCH AND TECHNOLOGY			
Program 1. Mining Technology		.75	.75
2. Mine Safety and Productivity			
Project 2.1 Ground Control	1.32		1.32
2.2 Warning Systems	.295		.295
2.3 Exposure Index		.295	.295
Program 3. Processing Technology			
Project 3.1 SO_2 Reduction	2.180		2.180
3.2 Milling Research	.470		.470
3.3 Tailings Research		1.10	1.10
3.4 Industrial Minerals	.4	.62	1.02
Subtotal Sector B	4.665	2.765	7.43
SECTOR C			
DEVELOPMENT STUDIES	.885	.885	1.77
SECTOR D			
PUBLIC INFORMATION, etc.	1.25	1.25	2.5
TOTAL	14.80	9.9	24.70

TABLE 2.

Sector 'A' Workplan 1987/88 Expenditures by program; Geological Survey of Canada (GSC) and Manitoba Geological Services Branch (MGSB)

PROGRAM	GSC* ($000)	MGSB ($000)
1 Precambrian Mapping	316.0	232.9
2 Minerals Investigations	234.0	382.2
3 Geophysical Surveys	586.0	-
4 Geochemical Surveys/Basal Till	574.0	30.0
5 Compilations	102.0	146.7
6 Overhead including Capital	38.0	-
TOTAL	1850.0	791.8

*To Dec. 31 1987, including forecast to Mar. 31, 1988.

Figure 2: Trimming granite samples in the Whiteshell.

Figure 3: Winter drill camp, Mawdesley Lake near The Pas.

Figure 4: Interlake reconnaissance, Grand Rapids uplands.

II. SECTOR A GEOSCIENTIFIC ACTIVITIES PROGRESS REPORT
REVIEW OF ACTIVITIES 1987/88

During 1987, geological surveys and investigations were undertaken in Manitoba by the Provincial and Federal Geological Surveys in this the fourth year of the (1984-89) Canada-Manitoba Mineral Development Agreement (MDA). This year's program entailed a slight shift in emphasis from field investigations to office compilation, data analysis, and report production.

The joint workplan for Sector A Geoscientific Activities was approved in March by the MDA Management Committee and copies distributed to members (6) of the newly expanded Mineral Exploration Liaison Committee (MELC).

Forty-six Provincial and twenty-two Federal projects were mounted with operational budgets of $792 K and $1855 K, respectively. Combined expenditures were 23% Lynn Lake directed, and 37% went toward the Flin Flon-Snow Lake region. The remaining 40% of programming was evenly divided between Southeast Manitoba, the Churchill-Superior Boundary Zone, the Gods and Island Lakes region, and Winnipeg-based compilations.

Ten Applied Geoscience Research Agreements were sponsored under the MDA with the Department of Geological Sciences, University of Manitoba; five through the Geological Survey of Canada (GSC), and five through Manitoba Geological Services Branch (MGSB).

In 1987, although most projects represented a continuation of work initiated in earlier years, several new projects were introduced as outgrowths of recommendations from industry. Where possible, other projects were modified to respond to specific requests from exploration personnel.

An outline of the intended programming was presented in each of the mining districts prior to the field season, and at the April meeting of the Winnipeg CIM. Pamphlets listing MDA projects scheduled for 1987 were distributed throughout Manitoba in late May.

Survey crews were deployed in May, the Provincial operations being supported by 25 students who were employed and trained for a combined total of 1684 days.

A Sector "A" Progress Report for 1986/87 was tabled in manuscript form at the April CIM meeting and final printed copies distributed June 29. Other publication releases continued throughout the year.

Survey personnel gave field tours and demonstrations for industry, university and government geologists working in the Kisseynew region, at Herb Lake, in the Churchill-Superior Boundary Zone, for building stone interests in Southeast Manitoba, and in support of ongoing research by NASA[1] personnel into the anorthosites and granitic plutons of the Bissett-Bird River region.

In the Phanerozoic sector of the Province, field tours provided detailed examination of Paleozoic sequences, as one of Manitoba's contributions to the 5th International Williston Basin Symposium, and the CSPG[2]-hosted 2nd International Symposium on the Devonian System.

As part of the Canadian-hosted XIIth International INQUA[3] congress, MGSB personnel (in concert with the GSC and Saskatchewan) led a 13-day field demonstration of Quaternary chronology and glacial deposits in Manitoba, Saskatchewan and Alberta.

Advice and guidance in the field were also provided in support of a feasibility study investigating the probable impact of iceberg scouring on seafloor pipelines.

Eight Manitoba-specific papers were given by MGSB staff, and nine by GSC geologists at the Geological Association of Canada-sponsored Symposia on "Gold in Central Canada" and the "Trans-Hudson Orogen" convened in May 1987 at Saskatoon.

In addition to their mandated activities MGSB personnel provided extensive advisory and editorial services to other Sectors of the Agreement including production of a Geological Highway Map of Manitoba, a Schools' Movie series, various educational pamphlets, presentations and tours for foreign investment interests and exploration executives, and the production of a brochure on Manitoba's Industrial Minerals. By year-end over 3000 copies of the Highways map had been distributed at various conventions and through the Winnipeg Information Office, 4000 copies were distributed through the CSPG to its members, and 4000 copies were delivered to the Manitoba Department of Education for distribution to schools.

An Interim Evaluation of the MDA by Price Waterhouse was completed in July 1987. Comments from industry provided valuable insight into the usefulness of MDA activities, as well as suggestions for new initiatives and improved services/liaison. The evaluation concluded that "during the first three years of its implementation (the Canada-Manitoba MDA) is generally well founded, efficiently managed and producing tangible results".

In a broader context, at the Mines Ministers' Conference in St. Johns (Newfoundland), the MDA mechanism for delivering government-sponsored industry-supportive minerals programming received favourable comment from industry (PDA and MAC)[4] the

[1]National Aeronautics and Space Administration
[2]Canadian Society Petroleum Geologists
[3]International Union for Quaternary Research
[4]PDA - Prospectors & Developers Association;
MAC - Mining Association of Canada;
CGC - Canadian Geoscience Council

geological community (CGC)[4], and senior officials from both levels of government. Manitoba also prepared a brief to the Ministers entitled "Mineral Development Agreement Support for Regional Economic Development; the importance of government geoscientific activities" on behalf of the Committee of Provincial Geologists. In late September 1987, Manitoba's MELC representatives were requested to canvas exploration interests in their respective regions for project proposals that could be considered for implementation during a successor agreement (1989-94), as well as suggestions for changes to the focus, level and emphasis of Survey programming in the longer term. These proposals were incorporated into the 1988-89 Workplan, and used as a principle reference in the development of a 5-year plan for future geological surveys and exploration-supportive minerals investigations to be conducted under a successor agreement (1989-94).

This year's Report of Field Activities (205 pages) contains written contributions from the Geological Survey of Canada, in the form of abstracts describing the results of their current MDA work in Manitoba. These valuable contributions, together with a GSC-generated preliminary geological map and report of the Elbow Lake area, complete the roster of progress reports covering government geoscientific activities conducted during the summer of 1987 under Sector A.

This year's offering of preliminary Precambrian maps (16) includes a 1:1 000 000 compilation of sub-Phanerozoic basement geology in Hudson Bay Lowland, and a 1:20 000 map of Elbow Lake by the GSC. The results of the 1987-88 field program were presented in a series of talks and displays at the annual Meeting with Industry in Winnipeg on November 23 and 24 (332 attendants including 232 guests).

During the winter months MGSB and GSC personnel gave six talks on various aspects of MDA work to northern Branch meetings of the Canadian Institute of Mining and Metallurgy in Lynn Lake, Thompson and Flin Flon.

For the balance of the year Provincial and Federal staff engaged in compilation and analysis of materials and data stemming from previous field seasons, as well as report production and talks given at various technical seminars in Manitoba and across Canada.

MDA displays were also featured at the Geological Survey of Canada Forum in Ottawa (January 19 and 20, 1988, 638 registrants).

From September 1987 to March 1988 MGSB staff responded to over 375 enquiries on minerals-related topics, in addition to other exchanges at the annual meeting in Winnipeg, and 230 enquiries received at the Provincial display booth at the annual of the Prospectors and Developers Association in Toronto (March 6-9, 4300 registrants).

A full listing of all geoscientific technical publications and other output generated during fiscal 1987-88 is presented in the section following the project descriptions.

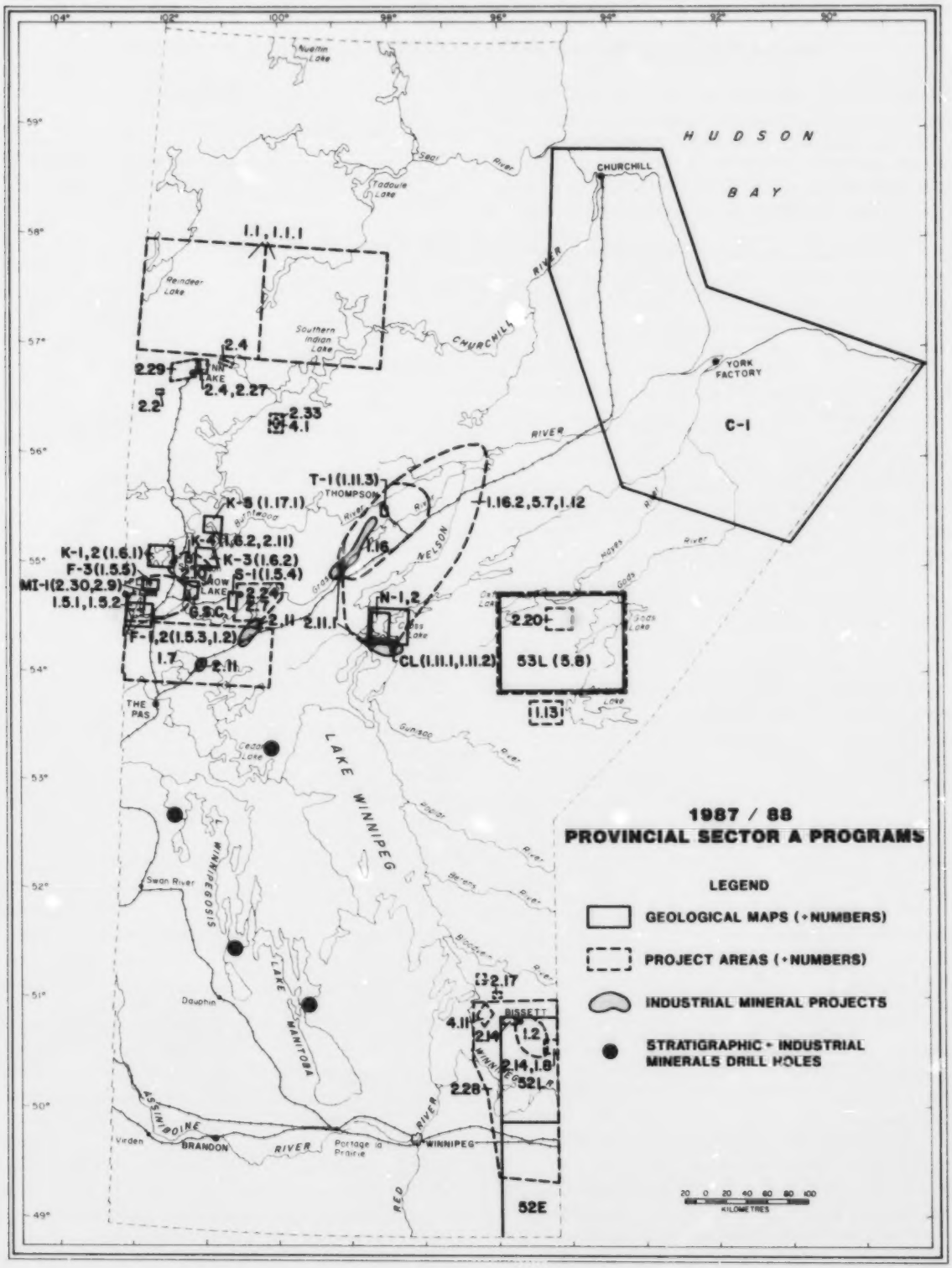
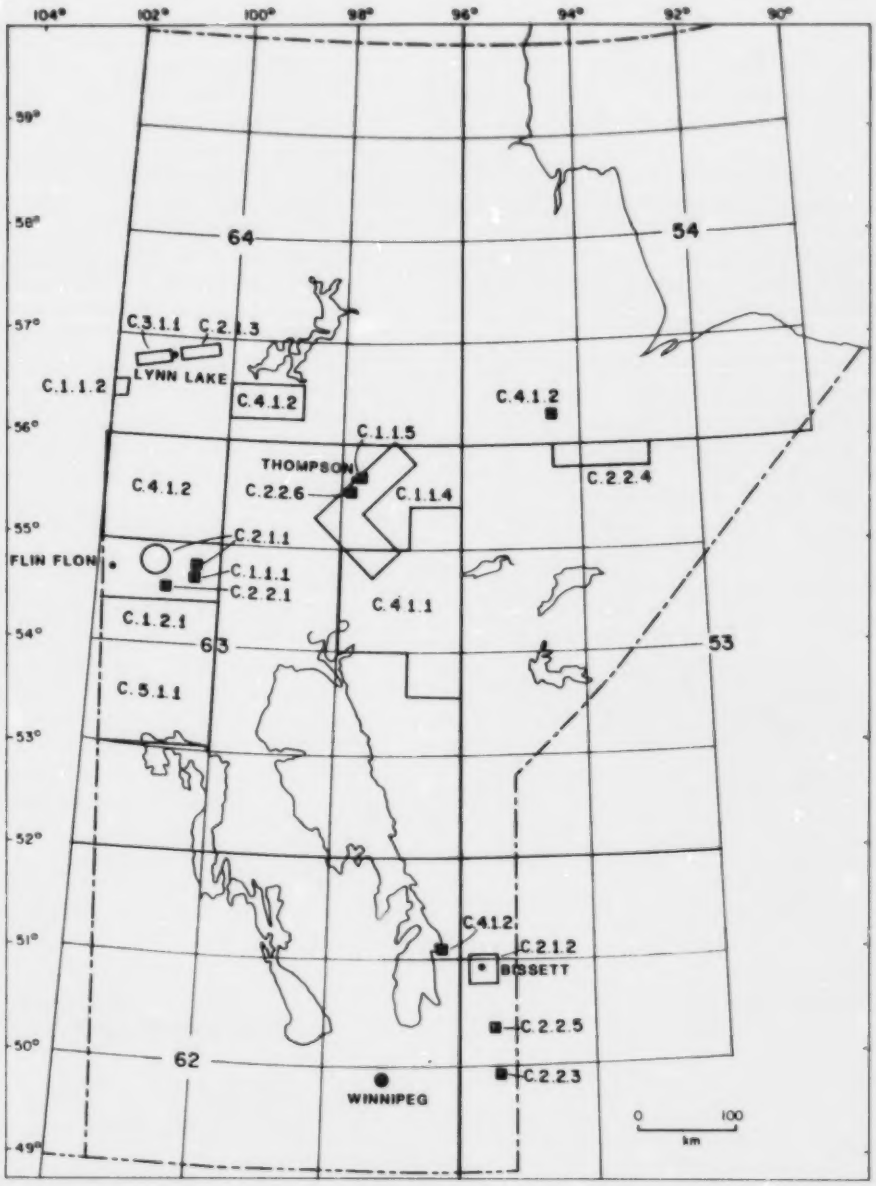


Figure 5: Location of Provincial Projects 1987/88.



Lithosphere & Precambrian Studies
C1.1.1 Mineralized Alteration Zones
C1.1.2 Metamorphism in the Lynn Lake-Laurie Lake Area
C1.1.3 U/Pb Geochronology, Churchill Province
C1.1.4 U/Pb Geochronology, N.W. Superior Province
C1.1.5 Structural Studies, Thompson Belt
C1.2.1 Subpaleozoic Compilation/Core Drilling

Mineral Resources Division - Mineral Deposits
C2.1.1 Flin Flon-Snow Lake Metallogeny
C2.1.2 Bissett Structural Studies
C2.1.3 Agassiz Remote Sensing Research
C2.2.1 Flin Flon-Snow Lake
C2.2.2 Northern Churchill
C2.2.3 Falcon Lake Stock

Mineral Resources Division - Mineral Deposits (cont'd)
C2.2.4 Fox River Sill
C2.2.5 Bird River Sill
C2.2.6 Thompson Nickel Belt

Earth Physics Branch
C3.1.1 Aeromagnetic Gradiometer INPUT Surveys

Mineral Resource Division - Exploration Geochemistry
C4.1.1 Geochemical Surveys

Terrain Sciences
C4.1.2 Glacial Prospecting
C4.1.4 Quaternary Geochemistry
C5.1.1 Quaternary Compilation

Figure 6: Location of Federal (GSC) Projects 1987/88.

III. PROJECT REPORTS:
DISTRICT I: LYNN LAKE-RUTTAN (including northern Churchill Province)

SUMMARY:

MANITOBA GEOLOGICAL SERVICES BRANCH:

Geological surveys and mineral investigations have been conducted in the Lynn Lake-Ruttan region to establish 'key' geological factors controlling mineralization, as well as to produce guidelines for mineral exploration activities aimed at discovering new base and precious metal ore deposits. Provincial and Federal surveys (that have generated numerous improved geological base maps, as well as airborne geophysical and geochemical data for this region) are now in advanced stage of development and analysis, prior to release as technical publications.

Mineral investigations have proceeded from systematic regional documentation to in-depth studies of specific deposit types along the Johnson Shear Zone, the iron formation associated with the "Rainbow trend", and an extension of Agassiz-type rocks westwards towards Fox Mine area.

Glacial dispersion fans of ore minerals derived from buried mineralized zones have been used as indicators to locate concealed deposits in Precambrian bedrock.

Continued exploration interest along the length of the Agassiz Metallotect inspired the successful search in 1986 for western extensions of the metalliferous zone in the Sheila Lake and Margaret Lake area west of the town of Lynn Lake. In 1987 a detailed examination of the 700 m thick stratigraphic section west of Burge Lake demonstrated significant differences to the Agassiz Metallotect including a lack of high-magnesium basalts, and the absence of abundant sulphide mineralization, carbonatization and silicification. In a similar context, searches at Frances Lake and Suttie Lake failed to encounter sections analogous to those of the metallotect.

A study of the MacLellan Mine revealed the presence of an early shear zone and associated zoned alteration pattern, paralleling the iron formations and high-magnesium basalt that are the most obvious features of the Agassiz Metallotect. The identification of this "paleo-shear zone" and its spawn the "North Shear" echoes a recurring theme in which silicified shear zones and their associated splays appear to be spatially coincident with (and possible conduits for) gold mineralization in the Churchill Province, e.g., McLeod Road thrust (Nor-Acme), Johnson Shear Zone, Rusty Lake fault (Vol), Tartan Lake and numerous others reported in the Athapapuskow and Flin Flon regions.

The recent discovery of gold at Farley Lake in sulphidized magnetite-rich banded iron formation has elevated interest in the metallogenic significance of the associated Agassiz Metallotect. Geological mapping at 1:5000 and geochemical sampling initiated in the Eagle Lake-Farley Lake area (in direct response to requests from exploration companies active in the area) demonstrated a good correlation between specific rock units and airborne INPUT anomalies as well as a consistent stratigraphy over much of the area. Near Ruttan, drill core from the Darrol Lake deposit was sampled to determine the level of gold and associated pathfinder elements. Outcrops in the vicinity of the Vol gold deposit were mapped and sampled, and it was noted that the associated sulphide zones may represent splays from the major east-trending fault that transects the Rusty Lake metavolcanic belt.

Till examinations in the region of the Vol fault were extended east, as well as to the south in the Darrol Lake area.

Re-inspection of Sickle conglomerates and associated arenites suggests a possibility for placer gold deposition derived from gold-bearing quartz veins in granodiorite lying beneath the Sickle unconformity.

Vegetation geochemical surveys continued in the Lynn Lake area.

Scheelite identified at Nickel Lake within the Agassiz Metallotect may have applications as a pathfinder mineral for gold exploration.

Several MDA-sponsored M.Sc. theses and a Ph.D. thesis were completed on studies initiated in earlier years on the LAR deposit, the Fox Mine, Cartwright Lake, and the felsic volcanic rocks of the Ruttan area.

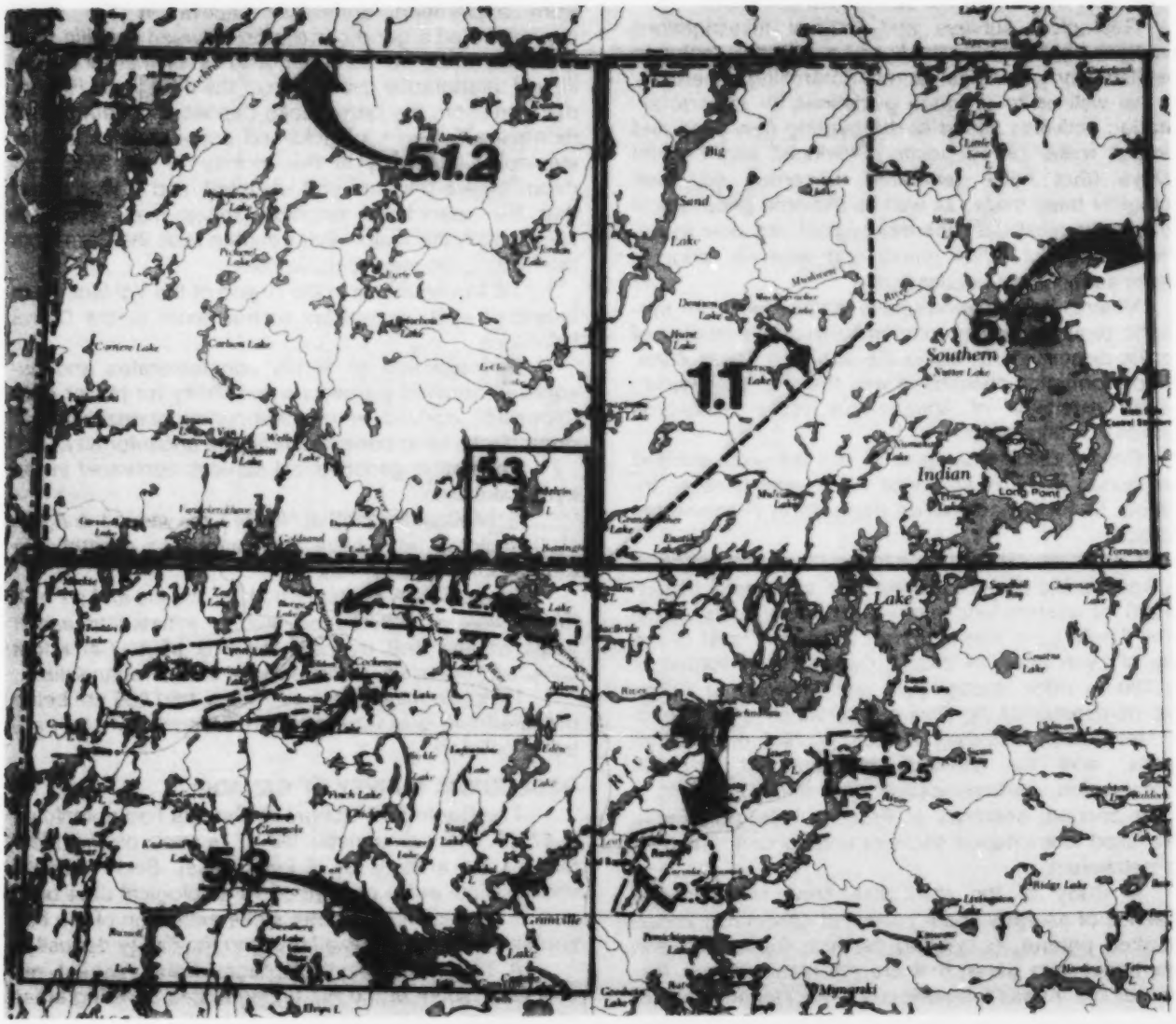
Synoptic mineral deposit maps 1:50 000 are being prepared and data for the mineral deposit inventory are being collated.

GEOLOGICAL SURVEY OF CANADA:

The Geological Survey of Canada has completed a $240K electromagnetic INPUT survey of the MacMillan Lake area (west of Lynn Lake). Survey results should allow enhancement of the geological data base east of Lynn Lake along the strike extension of the belt containing the MacLellan Mine and the Farley deposit.

A basal till sampling program was carried out north and south of the Ruttan Mine area covering areas of potential sulphide mineralization at a sampling density of 1 per km^2. A wider sample spacing was used in the Leaf Rapids-Ruttan-South Bay region in an attempt to map drift-covered sections of the greenstone belt using till lithology.

The study of metamorphosed alteration zones in the Laurie Lake region is continuing, with the purpose of determining the history of crustal evolution in the region with implications as to the timing and evolution of regional metallogenic provinces. Geochronological studies are also being carried out within the Kisseynew sedimentary gniess Belt in order to enhance our



DISTRICT I: LYNN LAKE - RUTTAN

1.1: Geological mapping Brochet-Big Sand Lake (Report production)
2.2: Gold deposits, Johnson Shear
2.4: Geochemistry, biogeochemistry and stratigraphy of the Agassiz Metallotect
2.5: Industrial Minerals evaluation
2.29: Mineral Deposit Geology, Lynn Lake
2.32: Iron Formation in Lynn Lake area
2.33: Mineral Deposits, Ruttan area
4.1: Basal Till Investigations, Ruttan
5.1.2: Northern Churchill Synoptic geological compilation
5.3: Lynn Lake report and maps

Figure 7: Provincial Sector A projects (1987) - District I: Lynn Lake-Ruttan.

knowledge of the tectonic, magmatic and metamorphic history of the Trans-Hudson Orogen.

Detailed in-fill lake sediment surveys were carried out in the McVeigh-Sickle Lake and Hughes-Rusty Lake regions in order to improve knowledge of factors influencing the mobility and accumulation of trace elements, in particular gold, in lake sediments. The refining of the regional lake sediment data will assist exploration companies in identifying prospective areas for exploration.

The Agassiz remote sensing project is continuing, with remote sensing data being compiled with available geochemical, geophysical and geological data bases. This multi-level approach will allow for further definition of mineral potential in areas of thick and extensive overburden.

PROJECT DESCRIPTIONS

MANITOBA GEOLOGICAL SERVICES BRANCH

PROJECT 1.1: Geological mapping, Big Sand-Brochet area

INVESTIGATOR: D.C.P. Schledewitz

OBJECTIVES:

To provide an updated and more detailed map and comprehensive report on NTS areas 64F and 64G to assist mineral exploration and evaluation of regional geochemical data.

PROGRESS:

Map production is complete; a report is being prepared, and will be completed in 1989.

PRODUCTS:

Two compilation maps with marginal notes, 64F and 64G, were prepared for the Branch's Bedrock Compilation Series. A regional geological summary describing the distribution and petrology of granitic rocks was presented at a Workshop, in April 1986, to develop a proposal for a lithoprobe transect across the Trans-Hudson Orogen. A paper discussing the geochemical and isotopic data co-authored with N.M. Halden, and G.S. Clark (University of Manitoba), and P.G. Lenton and M.T. Corkery (Manitoba Energy and Mines) was presented by N.M. Halden at the GAC Annual Meeting (1987, Saskatoon) with publication of the paper to follow.

FOLLOW-UP AND IMPLICATIONS:

A zone of mineralization outlined by mapping in the Le Clair Lake area yielded encouraging results during a subsequent basal till sampling program.

PROJECT 1.1.1: U-Pb zircon geochronology - Lynn Lake region (R.V.S.)

INVESTIGATORS: R. Van Schmus (University of Kansas)
D.C.P. Schledewitz

OBJECTIVES:

To provide precise age determinations of major plutonic rock units in the Lynn Lake, Southern Indian Lake and Chipewyan districts.

PROGRESS:

Refinement of preliminary U-Pb zircon ages previously reported.

PRODUCTS:

Isotope ages were used in the compilation maps 64F and 64G, to be printed in 1989. Final ages and interpretations are in manuscript form and are to be published in scientific journal.

FOLLOW-UP AND IMPLICATIONS:

Project completed after publication of products.

PROJECT 1.2: Uranium-lead isotope investigations, Southern Churchill Province

INVESTIGATORS: E.C. Syme, A.H. Bailes (Manitoba Geological Services Branch);
T.M. Gordon (Geological Survey of Canada)

OBJECTIVES:

To determine, by U-Pb isotope analysis, the ages of selected rock units in the Lynn Lake and Flin Flon regions. Accurate ages of volcanic and intrusive rock units comprise an essential part of the geological data base, and indirectly date the formation of enclosed base and precious metal deposits.

PROGRESS:

Several samples from the Flin Flon-Snow Lake area were analyzed at the GSC geochronology laboratory (see Project C.1.1.3).

PRODUCTS:

1. Paper in Canadian Journal of Earth Sciences (Baldwin, et al., 1987).
2. Abstract and talk at 1987 GAC-MAC Joint Annual Meeting (Gordon, et al., 1987).
3. Report in 1987 Manitoba Report of Field Activities (Syme, et al., 1987).
4. Planned paper summarizing geochronology in the Flin Flon-Snow Lake-Kisseynew area.

FOLLOW-UP AND IMPLICATIONS:

In 1989 further analytical work will be conducted in the region, to provide a more comprehensive aspect to the (established) data base. These age determinations will permit well documented and more precise in-

terpretations to be made on the timing of geological events in the southern Churchill Province.

PROJECT 1.3/1.16: Rubidium-strontium geochronology in Manitoba

INVESTIGATOR: G.S. Clark (University of Manitoba)

OBJECTIVES:

This is a continuation of work initiated in 1979 to determine Rb-Sr ages from lithotectonic domains of the Churchill and Superior Provinces in northern Manitoba. The establishment of a geochronological framework is an essential supplement to field mapping for constructing models of crustal evolution within the various domains and the relationship of the domains to one another, in order to identify the most favourable targets for future exploration programs.

This project will concentrate on rocks not dateable by the U-Pb method, and on dating ultramafic events.

PROGRESS:

Two rubidium-strontium ages from the Thompson Pit (1460 ± 20 Ma from biotite, 1620 ± 23 Ma from muscovite) and an apparent age from the Cross Lake area (2100 Ma).

PRODUCTS:

Report in MGSB Report of Field Activities 1987.

FOLLOW-UP AND IMPLICATIONS:

Isotopic data, once completed, will be integrated with other studies (geochemical, structural, U-Pb geochronology: see Projects 1.16.2, 1.11.3, C.1.1.4, C.1.1.5, C.2.2.6). Whole rock Pb isochrons and Sm-Nd studies are planned.

PROJECT 2.2: Gold deposits, Johnson Shear

INVESTIGATOR: D.A. Baldwin

OBJECTIVES:

To establish the controls for gold mineralization along the Johnson Shear Zone.

PROGRESS:

Geological field investigations on the shear zone have been completed. Field data have been collated and portrayed on geological maps and stratigraphic sections. Subsurface data collected from diamond drill core have been incorporated in diagrams displaying stratigraphy and patterns of alteration. Geochemical data on host rocks to mineralization, and on the mineralization are forthcoming.

PRODUCTS:

Preliminary results have been published in Report of Field Activities 1986 and 1987.

FOLLOW-UP AND IMPLICATIONS

The 1987 field work in the Gemmell Lake and Wilmot Lake areas indicate that the Johnson Shear Zone has a greater lateral extent than previously known. An M.Sc. thesis study on the gold mineralization and structure will be initiated with support from Hayes Resources (formerly SherGold). The potential for paleoplacer gold mineralization at the Sickle-Wasekwan boundary was recognized.

PROJECT 2.4: Rock geochemistry, biogeochemistry and stratigraphy of the Agassiz Metallotect

INVESTIGATOR: M.A.F. Fedikow

OBJECTIVES:

To examine the feasibility of using detailed and regional biogeochemical surveys to establish mineral exploration targets in the Lynn Lake area.

To determine whether the trace element content of peat bogs can be used as an indicator to locate "blind" gold mineralization along the Agassiz Metallotect.

PROGRESS:

The feasibility of detailed biogeochemical surveys has been discussed in OF84-1 and OF85-6. The geology of the MacLellan (Agassiz) deposit has been described in OF85-5. Additionally, the application of mercury-gas surveys to the search for gold along the metallotect has been attempted and reported on in OF85-11.

A report describing rock geochemical techniques used to distinguish gold-bearing from barren rocks along the Agassiz Metallotect and to determine the nature of the high Mg-Ni-Cr basaltic host rocks to the deposit is in preparation. This report will describe the trace and major element dispersion phenomena associated with the mineralized zones and attempt to ascertain the origin of the high Mg-Ni-Cr basalts.

The use of black spruce bark as a vegetation geochemical exploration tool was examined in the Dot Lake area and found to be successful where appropriate drainage and overburden conditions are present. This information has been released as an open file report. The Spider Lake area has been ascertained to represent the easternmost extent of the Agassiz Metallotect as a result of detailed stratigraphic studies in the area. The results of this program were described in the 1986 Report of Field Activities.

Analysis of vegetation samples collected at Dot Lake is ongoing. Black spruce needles have been analyzed and the twigs are being prepared for analysis.

PRODUCTS:

The results of this program are being released as open file reports as preliminary and final interpretations become available. Detailed stratigraphic sections and

results of peat bog and vegetation geochemical studies are being prepared.

FOLLOW-UP AND IMPLICATIONS:

Recent discoveries of gold mineralization (Farley Lake, Dot Lake) along the Agassiz Metallotect, in addition to the MacLellan Mine, indicate enormous potential in these rocks for repetitions of Agassiz-type or other styles of gold mineralization. Stratigraphic and geochemical studies are to be continued along the entire Metallotect in an attempt to identify more localized zones of higher gold potential.

PROJECT 2.5: Industrial minerals evaluation, Lynn Lake area

INVESTIGATORS: W.R. Gunter and P.H. Yamada

OBJECTIVES:

To evaluate reported occurrences of building stone and other industrial minerals in the Lynn Lake/Leaf Rapids/Thompson area. The deposits will be sampled to determine the suitability of the material for industrial mineral use. Detailed mapping and sampling will be conducted on those deposits considered to be geologically favourable.

PROGRESS:

Property evaluations in the Lynn Lake-Thompson region have been undertaken on: (1) marble in the Thompson area; (2) serpentinite in the Moak Lake area; (3) granite in the Ospwagan Lake area; and (4) migmatites in the Sasigui Rapids area. These assessments are of a preliminary nature and are to be continued in more detail in 1987/88.

PRODUCTS:

A preliminary report GS-17, in the 1987 Report of Field Activities, describes the findings in the Snow Lake and Thompson areas. The value of industrial minerals as a mineral commodity has been communicated to geologists working in private industry.

Initial results warrant continuation of this project.

FOLLOW-UP AND IMPLICATIONS:

The detailed study of the Thompson marble occurrences will be continued in 1988/89. These studies are designed to quantify the volume of material present and to bulk sample the marble for quality testing, i.e. strength and resistance to abrasion. Preliminary investigations will be conducted to determine the ceramic potential of pegmatites in the Red Sucker Lake area and the Gods Lake area.

PROJECT 2.27: Remote sensing: Agassiz Metallotect

INVESTIGATORS: M.A.F. Fedikow (MGSB);
W. Moon and V. Singh (University of Manitoba)

OBJECTIVES:

To identify mineralization buried beneath glaciolacustrine deposits. Remote sensing techniques, using MEIS II and MSS spectral scanners, will determine if airborne detection of vegetation stress can be used to identify buried precious or base metal mineralization. The entire region underlain by the Agassiz Metallotect is to be investigated.

PROGRESS:

As part of the Agassiz Metallotect Remote Sensing project detailed bedrock geology, surficial geology, vegetation distribution, INPUT electromagnetic data, and vertical field gradiometer data are currently being digitized. These data have been integrated with multispectral MEIS II data by W. Moon and V. Singh and analysis is continuing.

PRODUCT:

Hard data tapes containing raw data from remote sensing. Residual anomaly maps indicating sites of metal-induced stress in vegetation.

FOLLOW-UP AND IMPLICATIONS:

1. Airborne Survey of the Agassiz Metallotect by the Canada Centre for Remote Sensing.
2. Acquisition of the data tapes.
3. Merging remote sensing data with digitized geological, geophysical and geochemical data.
4. Computer-aided manipulation of acquired data is continuing.

In 1987-88 the project is to be coordinated and funded by the GSC as Project C.2.1.3.

PROJECT 2.29: Mineral deposit documentation, Lynn Lake Area

INVESTIGATOR: D.A. Baldwin

OBJECTIVES:

To establish the geological setting and controls on mineralization of selected mineral deposits in the Lynn Lake area.

PROGRESS:

Field studies in the Sheila Lake and Margaret Lake area were aimed at searching for stratigraphic sections and high Mg-Ni-Cr basalts similar to those at the MacLellan Mine. In addition, a 700 m thick stratigraphic succession on the west shore of Burge Lake that contains numerous layers of oxide facies iron formation was examined for comparison with the Agassiz Metallotect.

The Burge Lake section is not similar to the Agassiz Metallotect. In the Sheila Lake-Margaret Lake area no new occurrences of high Mg-Ni-Cr basalts were encountered, neither were stratigraphic sections similar to that of the Agassiz Metallotect identified.

PRODUCTS:

Preliminary results have been published (GS-3) in the Report of Field Activities 1987.

FOLLOW-UP AND IMPLICATIONS:

The existing mineral deposit data base for the Lynn Lake area will not be expanded during the 1988 field season. Mineral occurrence and deposit maps (1:50 000) and accompanying mineral occurrence and deposit index files will be prepared for the Lynn Lake area.

It appears that west of the MacLellan Mine the Agassiz Metallotect stratigraphy terminates in the Sheila Lake-Margaret Lake area.

PROJECT 2.33: Mineral deposit documentation, Ruttan Lake Area

INVESTIGATOR: D.A. Baldwin

OBJECTIVES:

To investigate the geological setting of the Vol deposit and the gold potential of the Darrol Lake sulphide deposit.

PROGRESS:

A cursory examination of the Vol deposit was made. Three en echelon disseminated sulphide zones in intrusion breccia were identified. The sulphide zones may be in fault splays associated with a major east-trending fault.

Drill core from the Darrol Lake deposit was examined and the oxide facies iron formation was sampled. Geochemical and petrographic data on these samples are forthcoming.

PRODUCTS:

Preliminary results have been published (GS-5) in the Report of Field Activities, 1987.

FOLLOW-UP AND IMPLICATIONS:

No additional field studies will be initiated in 1988/89. Future studies at these localities will await geochemical results for samples collected in 1987.

PROJECT 4.1: Basal till investigations, Lynn Lake-Leaf Rapids area

INVESTIGATOR: E. Nielsen

OBJECTIVES:

To continue the evaluation of till geochemistry as a method of exploration for base and precious metals. Case studies of glacial dispersion are implemented in and adjacent to known mineral occurrences. In addition, till geochemical anomalies are mapped in selected areas of little or no outcrop to aid in the search for mineralization.

PROGRESS:

Field work in the Darrol Lake area and along the Vol fault resulted in 64 till samples being collected. The geochemistry on the less than two microns and heavy mineral fractions have been completed.

A prominent gold anomaly with values up to 19 000 ppb gold was mapped in the till along the Vol fault.

PRODUCTS:

Open File Report OF87-2 detailing the results of the till investigation in the Dot Lake-MacLellan Mine area was released in November, 1987.

FOLLOW-UP AND IMPLICATIONS:

The Vol fault study is finished and no further work is planned in this area. The Darrol Lake study will be extended in the 1988 field season.

PROJECT 5.1.2: 1:250 000 geological compilation, Churchill River

INVESTIGATORS: M.T. Corkery, P.G. Lenton and D.E. Kowerchuk

OBJECTIVES:

To synthesize and compile all geological data of Lower Churchill River area (NTS 64H, 54E). See Project 5.1 for further details.

PROGRESS:

Cartography 90% completed.

PRODUCT:

Two printed maps at a scale of 1:250 000 by summer 1988.

FOLLOW-UP AND IMPLICATIONS:

Printed maps will extend coverage of 1:250 000 synoptic compilation series of northern Churchill; NTS 64G and 64F to follow in 1989.

PROJECT 5.3: Lynn Lake report and maps

INVESTIGATORS: H.V. Zwanzig, H.P. Gilbert and E.C. Syme

OBJECTIVES:

Geological maps and technical reports describing the geology and mineral occurrences in the Lynn Lake-Ruttan region are to be prepared in order to aid, and to focus mineral exploration in this region.

PROGRESS:

Maps for 64C/5 (Kamuchawie Lake), 64C/6 (Kadeniuk Lake) and 64C/16 (Barrington Lake) are being drafted; 64B/13 (Fraser Lake), and part of 64F/1 (Melvin Lake) are near completion for drafting. A manuscript for external publication on gneisses south of Lynn Lake is 90% completed and a manuscript on

the geochemistry of volcanic rocks in the Lynn Lake area has been completed. A report on the sedimentary rocks in the Lynn Lake area is 80% completed.

PRODUCTS:

Oral presentations and abstracts at the GAC-MAC Annual Meeting,1987 included: "Stratigraphy and tectonics of the Kisseynew Complex, Manitoba"; "Stratigraphy and geochemistry of two Proterozoic arcs: Lynn Lake and Flin Flon metavolcanic belts, Manitoba"; "U-Pb zircon ages from the Lynn Lake and Rusty Lake metavolcanic belts, Manitoba; two ages of Proterozoic magmatism"; Canadian Journal of Earth Sciences, v. 24, p. 1053-1063, co-authored with D.A. Baldwin (MRD) and T.M. Gordon, P.A. Hunt and R.D. Stevens (GSC).

FOLLOW-UP AND IMPLICATIONS:

Reports describing the structure and the implication of zircon geochronology for the Lynn Lake area, and describing the geology between Kamuchawie and Granville lakes and between Barrington and Fraser lakes are to be completed in 1990.

GEOLOGICAL SURVEY OF CANADA:

PROJECT C.1.1.2: Metamorphic studies: Kisseynew Gneiss Belt

INVESTIGATORS: T.M. Gordon (GSC/LCSD),
S.L. Jackson (Queen's U.)

OBJECTIVES:

To elucidate the metamorphic history of rocks on the southern flank of the Lynn Lake greenstone belt. Thesis study of mineral assemblages and mineral compositions in pelitic and mafic rocks of the Wasekwan Group to document the chemical and mineralogical changes and pressure-temperature conditions during metamorphism and the relationship of metamorphism to deformation.

PROGRESS:

Steve Jackson has completed petrographic studies and microprobe and structural analysis as part of his doctoral study at Queen's University (under D. Carmichael) of metamorphism in the Laurie Lake area. Mineral assemblages in metamorphosed alteration zones were used to define the metamorphic zonation, previously established on the basis of reactions in more potassic rocks. Also, a structural model of fabric elements has been nearly completed, which involves the recognition of a series of early major faults along the Lynn Lake-Kisseynew margin.

PRODUCTS:

Gordon, T.M., 1987: GSC-2: Alteration studies, Kisseynew Gneiss Belt (Project C.1.1.2); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 168.

FOLLOW-UP AND IMPLICATIONS:

Jackson will be refining the relationship between the metamorphic and tectonic history of the south margin of the Lynn Lake belt in the Laurie Lake region. In addition to this, he will be investigating the margin further to the east.

An understanding of the relationship of the Lynn Lake volcanic belt to the marginal sedimentary basins will allow industry to better evaluate the environment for its massive sulphide potential, as well as the relationship of major dip-slip faults to precious metal mineralization.

PROJECT C.2.1.3: Agassiz remote sensing

INVESTIGATORS: W. Moon (U. of M.),
A. Rencz (GSC/MRD)

OBJECTIVES:

To evaluate the contribution of integrated multitype data analysis to geological mapping and mineral exploration using a portion of the Lynn Lake volcanic belt from the MacLellan Mine east to the Farley deposit. The digital image analysis system at University of Manitoba will be used to integrate the data available from this region.

PROGRESS:

Work is now underway on the second year of a contract with Dr. Moon of the University of Manitoba, under the supervision of Andy Rencz (GSC), to study the Agassiz metallotect using multi-variate data sets including remotely sensed and geochemical data. The first year of the study experienced certain difficulties, particularly with respect to computer breakdowns. However, the investigators were able to acquire airborne remotely sensed and geochemical data. The objective of the study will be to analyze the remotely sensed data and correlate the results with geophysical and geochemical data in order to further define the geologic setting in the region.

PRODUCTS:

Poster display at the CIM annual branch meeting, Winnipeg, April 1987.

Rencz, A., 1987: GSC-8: Agassiz Remote Sensing (Project C.2.1.2); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p.170.

FOLLOW-UP AND IMPLICATIONS:

This study will be completed by March 31, 1989. The refinement of this type of study is important in allowing explorationists to utilize an alternative multi-level approach to exploring in regions of heavy overburden and scarce outcrop.

PROGRAM C.4.1.1: Geochemical surveys

INVESTIGATORS: R. Schmitt (GSC/MRD),
P.W.B. Friske (GSC/MRD)

OBJECTIVES:

To conduct regional geochemical reconnaissance surveys in selected areas of Manitoba, which will be determined in conjunction with the provincial survey. Sample collection, preparation and analysis will be contracted out, while the final open file production and release will be done by the GSC. Detailed fill-in survey and data interpretation will also be completed by the GSC.

PROGRESS:

During the past field season a regional lake sediment and water survey was carried out by the Geological Survey of Canada covering approximately 21 600 km^2 of central Manitoba (63H [NE], 63-I, 63P [SE]). Samples were collected from a total of 1699 sites, for an average desity of one sample per 12.7 km^2.

Lake sediments will be analyzed for Zn, Cu, Pb, Ni, Co, Ag, Mn, Cd, Fe, Mo, V, As, Hg, U, LOI, Sb, and Au. Lake waters will be analyzed for U, F, Ca, Mg, Alkalinity and pH.

In addition to the regional lake sediment survey being carried out in 1987, detailed in-fill sampling and interpretation of previously released geochemical data are being undertaken on map sheets 64B and 64C.

Results of the 1986 lake sediment and water survey, covering 39 000 km^2 at an average density of one sample per 11.4 km^2, were released on July 7, 1987 as GSC Open File 1358, consisting of 25 maps and 231 pages of text. Data are available for the same suite of elements as this year's survey.

PRODUCTS:

See "Progress".

Friske, P.W.B. and Schmitt, H.R., 1987: Regional Geochemical Lake Sediment and Water Survey, East-central Manitoba, parts of NTS 53E, 53F, 53K, 53L, 53M; Geological Survey of Canada Open File 1358, 231p. + 25 maps.

Poster presentation at the Manitoba Meeting with Industry, 1987.

Friske, P.W.B. and Schmitt, R., 1987: GSC-16: Geochemical Surveys (Project C.4.1.1); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p.173.

FOLLOW-UP AND IMPLICATIONS:

Survey results will be released as GSC Open File 1641 in the summer of 1988, consisting of sample location and value maps at 1:250 000 scale, and a text containing field, analytical and statistical data. Results of the infill survey on the Lynn Lake-Leaf Rapids area will also be released as a GSC open file in 1988 at 1:10 000 scale.

Research into improving data analysis and presentation will allow explorationists to better evaluate the results of the lake sediment surveys.

PROJECT C.4.1.2: Drift prospecting program

INVESTIGATORS: C.A. Kaszycki (GSC/TS),
R.N.W. DiLabio (GSC/TS)

OBJECTIVES:

To provide baseline information regarding regional ice flow patterns, dispersal directions, and drift composition in the Lynn Lake - Leaf Rapids - Flin Flon region (NTS 64B,C,F,G, 63N,O), as an aid to mineral exploration in northwest Manitoba. This involves regional mapping of surficial deposits at 1:100 000 scale, systematic till sampling of the same areas to evaluate drift composition, and mapping both large- and small-scale patterns of glacial dispersal. Regional sampling will be supplemented by more detailed studies in areas of potential economic interest identified on the basis of: anomalous till geochemistry, local bedrock geology, aeromagnetic and airborne anomalies, and modern lake sediment geochemistry. Specific objectives are: 1) to define the influence of local bedrock lithologies, particularly those comprising greenstone belts, on till composition and to determine if till lithology can be used to extend bedrock mapping in areas of extensive drift cover; 2) to evaluate the applicability of surficial geochemical surveys, including modern lake sediment geochemistry, in terrains dominated by various types of surficial deposits; 3) to develop till sampling and analytical strategies for drift prospecting in areas of boreal forest where access is limited, clay cover is problematic, and drift composition is dominated by exotic debris (e.g. Paleozoic carbonate), thereby suppressing local bedrock signature.

PROGRESS:

During June and July 1987, detailed sampling was carried out in the Rusty Lake - Opachuanau Lake area north of the Ruttan Mine, and in the Darroll Lake - Karsakuwigamak Lake area south of Ruttan, with the objective of covering areas of potential sulphide mineralization. On a regional level, approximately 100 samples were collected over the greenstone belt in the Leaf Rapids - Ruttan - South Bay area in an effort to map drift-covered extensions of the belt using till lithology.

Spot sampling of till east of Baldock Lake was carried out to check aeromagnetic anomalies suspected to be ultramafic intrusions similar to those found in 1986 at Osik Lake and Baldock Lake through boulder tracing and till sampling. Follow-up work in the Osik Lake region was undertaken to determine the source of high Au concentration in the heavy mineral fraction of several samples in the uppermost part of a

till section within the ultramafic dispersal train. Samples of possible gold-bearing erratics and bedrock of similar lithology were collected and will be analyzed for Au. Further sampling was also carried out in the Wheatcroft Lake study area.

Backhoe sampling of gold-bearing Lake Agassiz beach sands and underlying till at Manigotagan was completed in an effort to identify sedimentologic controls on these placers. Several large exposures between Lynn Lake and Leaf Rapids were also excavated by backhoe and studies were carried out to provide detailed stratigraphic, sedimentologic and compositional information concerning till provenance and dispersal directions. Preliminary study of till composition and genesis of lithologically banded till near Gillam was also completed, in an attempt to identify the glaciologic controls on compositional variability in exotic tills.

Surficial geology maps for NTS 64F, G and B have been completed. A contract for airphoto interpretation and compilation of surficial geology maps for NTS 63N and O has begun. Till geochemical data for NTS 64G and B, and 63N are being compiled.

During the winter Kaszycki presented papers in Flin Flon and Thompson on the applicability of drift prospecting in Northern Manitoba.

PRODUCTS:

DiLabio, R.N.W., and Kaszyki, C.A., 1987: GSC-17: Drift Prospecting Program (Project C.4.1.2); In Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p.173.

DiLabio, R.N.W. and Kaszycki, C.A., 1988: An ultramafic dispersal train and associated gold anomaly in till near Osik Lake, Manitoba; In Current Research Part C, Canadian Shield, Geological Survey of Canada Paper 88-1C, pp.61-66.

DiLabio, R.N.W., 1987: Placer gold at Manigotagan, Manitoba; Prospectors and Developers Association Annual Meeting, Toronto, March.

Kaszycki, C.A., 1987: Carbonate dispersal and till geochemistry, northwestern Manitoba; Abstract, CIM Bulletin, March 1987, p.66.

Kaszycki, C.A., Suttner, W. and DiLabio, R.N.W., 1987: Gold and arsenic in till, Wheatcroft Lake dispersal train, Manitoba; In Current Research, Part C, Geological Survey of Canada, Paper 88-1C. p. 341-351.

Kaszycki, C.A., 1988: Till composition and glacial dispersal - influence on the resolution of geochemical anomalies; Abstract, Prospectors and Developers Annual Meeting, Toronto.

Nielsen, E, and DiLabio, R.N.W., 1987: Investigations of Quaternary placer occurrences in the Manigotagan area; Abstract, Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p.110-112.

Poster presentations (two) at the Manitoba Meeting with Industry, 1987.

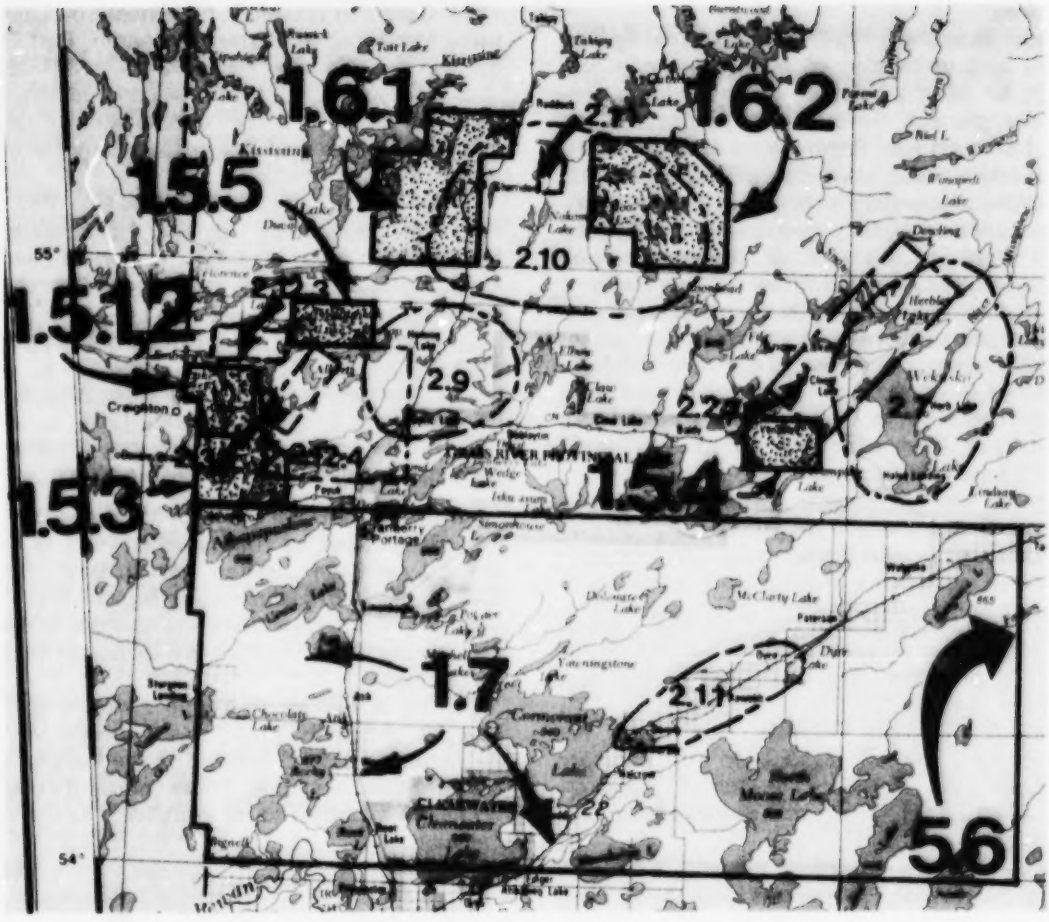
Poster presentation at the Geological Survey of Canada Current Activities Forum, 1988.

Poster presentation at the Prospectors and Developers Association Annual Meeting, 1988.

FOLLOW-UP AND IMPLICATIONS:

Studies will be completed on the follow-up survey in the Lynn Lake - Ruttan - South Bay - Rusty Lake - Darrol Lake - Wheatcroft Lake region. This will provide stratigraphic, sedimentological and compositional data concerning till provenance and dispersal for exploration companies.

The remainder of the year will be spent for final analysis and writeup of project results, which will be published as a GSC Bulletin on the surficial geology of northwestern Manitoba. Three theses (two MSc. and a BSc.) are expected to be completed in the 1989-90 fiscal year.



DISTRICT II FLIN FLON - SNOW LAKE

1.5.1: 1:20 000 mapping, Flin Flon, etc.
1.5.3: 1:10 000 mapping, Athapapuskow Lake
1.5.4: 1:20 000 mapping, Chisel Lake-Morgan Lake
1.5.5: Tartan Lake geological mapping
1.6.1: 1:20 000 Kississing Lake mapping
1.6.2: 1:20 000 Batty Lake mapping
1.7: Scout drilling, Project Cormorant
2.7: Gold deposits, Snow Lake area
2.9: Deposit documentation, Flin Flon
2.10: Deposit documentation, Sherridon
2.11: Industrial minerals investigations
2.12.3: Tartan Lake Geochemistry
2.12.4: Metallogeny of Felsic Intrusive Rocks, Flin Flon
2.24: Copper-zinc deposits, Snow Lake area
2.30: Mineral deposit geology - Flin Flon
5.6: Sub-Paleozoic compilation

Figure 8: Provincial Sector A projects (1987) - District II: Flin Flon-Snow Lake.

DISTRICT II: FLIN FLON-SNOW LAKE

Summary:

MANITOBA GEOLOGICAL SERVICES BRANCH:

During the MDA, the Provincial Geological Services Branch and Federal Geological Survey have mounted numerous mapping programs and other technically specialized minerals investigations aimed at documenting the geological setting of known mineralization, and determining the structural, chemical and genetic controls that resulted in the formation of the copper- and zinc-bearing orebodies that are now being rapidly depleted. Increased emphasis has also been given to the greenstone belts' potential to contain significant gold deposits that may have been overlooked in previous massive-suphide-focussed exploration campaigns.

From Athapapuskow Lake to Hargrave Lake total field and vertical gradient magnetic surveys and scout drilling have been used to develop maps of the buried Precambrian Shield that industry can use to trace mineralized formations beneath the limestone cover-rocks to latitude 54°.

In this region and the Lynn Lake district the industrial mineral resources have been evaluated to explore the potential for new industries based on abrasives, refractories, building stone, soapstone, and other industrial minerals.

Detailed mapping, sampling, and mineral deposit investigations focussed on the Tartan Lake and Baker Patton deposits.

In the Snow Lake region, the bulk of data acquisition for preparation of 1:50 000 and 1:20 000 scale metallogenic maps has been completed. Further evidence was obtained supporting the concept that polymetallic quartz veins, within or close to mafic volcanic rocks containing Cu-Zn massive sulphide deposits, represent a genetically associated 'leakage' or 'sweat-out' alteration phenomenon.

Industrial minerals investigations focussed on garnet and sillimanite deposits at Star Lake, garnet and marble at Thompson, and dolomite south of the exposed Flin Flon and Snow Lake greenstone district.

Mineral deposit studies in the Kisseynew terrain entailed detailed mapping of selected mineral occurrences at Puffy and Wood lakes. It is now apparent that quartzofeldspathic gneisses may locally occur within the so-called Nokomis greywacke sequence; however, the structural as opposed to stratigraphic controls on this more complex configuration have yet to be resolved.

A prototype Mineral Deposit Map and accompanying report were completed as Mineral Deposit Series, Report No. 1.

In the Athapapuskow region 1:20 000 mapping encountered superbly exposed 0.3-1.9 km thick sections of proximal Missi conglomerates as well as basaltic sequences with a rare earth signature more akin to volcanics from "spreading centres" rather than the "island arc" affinity typical of the Flin Flon metavolcanics to the north. Three additional rhyolite flow complexes were identified and all block-bounding faults were traced through from the Flin Flon-White Lake area.

Repeated attempts over the last few years to isolate dateable zircons from the Flin Flon volcanic belt were finally successful and firm ages were obtained for an Amisk rhyolitic crystal tuff from the Bear Lake Block (1886 Ma), as well as an unfoliated granodiorite from the Lynx Lake pluton (1847 Ma). The volcanic age is intermediate between that of the Wasekwan (1910 Ma) and the Ruttan volcanics (1878 Ma) but compares favourably with zircon ages of volcanic rocks in the La Ronge and Glennie domains, as well as the Hanson Lake Block.

Documentation of the structure and stratigraphy of the Amisk Group north of Flin Flon extended the block-bounding faults, mafic intrusions and volcanic sequences (demonstrated in the White Lake region) north and west towards Saskatchewan. Structural and compositional features were used to categorize the three mafic intrusive complexes in the region and to discriminate between complete and incomplete tectonized stratigraphic sequences. Several new occurrences of mineralization were encountered, the most prominent lying within or close to the margins of the supracrustal enclaves within the Tartan Lake Gabbro Complex.

The complex relationships of the Burntwood and 'Sherridon' gneisses on Kississing Lake were partially resolved into four fundamental 'type' lithological sequences with structural overprinting ranging from early recumbent folding, through synkinematic intrusion of major plutons and shear zone formation, to late stage conjugate faulting with varying degrees of associated retrograde metamorphism.

Gradiometer and total field surveys conducted in 1986 by the GSC were used extensively and with varying success to aid 1:20 000 and 1:50 000 geological mapping of the Kisseynew metamorphic complex in the Batty Lake, Limestone Point Lake and Star Lake area. Large areas previously designated as Sherridon and Nokomis paragneiss were reinterpreted as orthogneiss derived by dynamothermal metamorphism of intrusive rocks. Distinctive porphyroblastic gneisses at the margins of the orthogneiss are thought to represent tectonized alteration zones comprising locally mineralized schuppen complexes of supracrustal rocks.

On Limestone Point Lake an outlier of locally fossiliferous isoclinally folded Paleozoic dolomite, with a

pronounced fracture cleavage, testifies to a post-Paleozoic deformational event for which there is little evidence elsewhere in the Province. Projections of the Paleozoic/Precambrian surface from south of Reed Lake suggest the outlier is depressed by 120 m below its original position; however, the nature and orientation of the bounding structures remain unknown.

Detailed 1:15 840 mapping continued in the Chisel Lake area with the prime objectives being to provide an improved understanding of the complex stratigraphic and structural relationships in this economically significant portion of the Flin Flon metavolcanic belt. This year's work succeeded in establishing the stratigraphic setting of the Chisel, Lost and Ghost Lake mineralized zones, confirmed the restriction of hydrothermally altered rocks to the stratigraphic footwall, identified a key marker unit that can be used to guide future base metal exploration, and illustrated the fundamental role that interference fold structures can have in localizing the distribution of base metal mineralization.

At the west end of Burntwood Lake one of the few known aegirine-augite syenites in the southeastern Churchill Province was mapped and sampled in detail to obtain further information of this body's geochemistry and potential to contain rare elements. Although highly folded and deformed the intrusion exhibits unique igneous layering and cumulus textures that confirm a well fractionated and differentiated magma.

Close to 400 samples collected from granitic intrusives in the Flin Flon belt are being analyzed at the University of Manitoba as the initial step of a longer term program to geochemically categorize the felsic intrusions of this region and evaluate their metallogenic potential.

Ten additional drill holes were put down south of Athapapuskow Lake as a continuation of the sub-Paleozoic compilation in the Project Cormorant area. Evaluation of Taiga's geological compilation, and gradiometer data, is continuing to generate new insights into the basement geology, and suggests the existence of a high-grade gneissic domain south and west of the main greenstone belt.

GEOLOGICAL SURVEY OF CANADA:

Geochronological sampling continued in the belt in order to pinpoint ages within the Amisk Group volcanics and the syntectonic intrusions.

Field work was completed on alteration studies in the Sherridon Snow Lake and Wolverton Lake areas. These studies are concentrating on alteration zones commonly associated with massive sulphide deposits in the region. A clearer definition of the mineral assemblages within these zones will allow exploration companies to better understand the different types of synvolcanic alteration and their spatial relationships to ore bodies.

The sub-Phanerozoic geological compilation program continued, with relogging of all available core and the drilling of up additional new holes in the southern half of 63K by the end of the fiscal year. Closely tying known formations to geophysical signatures will allow for the compilation of much more detailed and accurate maps of the Precambrian rocks below the Phanerozoic.

The field component of gold studies in the belt was completed. Maps of the geological setting of gold in the Snow Lake and Elbow Lake regions are being completed, as well as a report on the geochemistry and structure of the gold deposits on the east shore of Wekusko Lake.

Samples selected from mafic-ultramafic intrusions in the belt are being analysed for PGE concentrations. This is in conjunction with a study being completed on the chemistry and internal stratigraphy of these intrusions.

Airborne vertical gradient and total field magnetic survey maps for the Flin Flon and Root Lake (Namew) were released as 1:20 000 scale open file maps in the late autumn of 1987.

Ground-truthing airphoto interpretation of surficial geology was completed in the The Pas area for NTS areas 63C, F and K.

PROJECT DESCRIPTIONS

MANITOBA GEOLOGICAL SERVICES BRANCH

PROJECTS: 1.5.1 and 1.5.2: 1:20 000 scale geological mapping, Flin Flon area

INVESTIGATORS: A.H. Bailes and E.C. Syme

OBJECTIVES:

The objective of this project is to provide a sound geological data base for future mineral exploration in the Flin Flon base metal (and gold) mining camp. A major goal, in addition to the production of high quality 1:20 000 scale geological maps, is to stratigraphically subdivide the Amisk Group volcanic supracrustal rocks and place mineral deposits within this stratigraphic framework. A further goal is to identify the environmental conditions that existed at the time of mineralization with a view to determining those conditions that were favourable to deposition of the mineral deposits.

PROGRESS:

In 1987 all activities were directed towards completing the final draft of a report on the geology of the Flin Flon-White Lake area.

PRODUCTS:

A final map with marginal notes has been printed. The final report, scheduled for completion in 1988, will contain all the pertinent information and conclusions required by mineral exploration companies.

FOLLOW-UP AND IMPLICATIONS:

Activity in 1988 will be directed entirely towards publication of the final report on the Flin Flon-White Lake area. This report and accompanying map will provide a significant upgrading of the geological data base for the Flin Flon mining camp, such that future exploration in this area can proceed in a rational and productive manner. The stratigraphic subdivisions of Amisk Group volcanic rocks can be extended beyond the immediate map area and should provide a sound basis for future geological projects in the Flin Flon district.

PROJECT 1.5.3: 1:20 000 scale geological mapping, Athapapuskow Lake area

INVESTIGATOR: E.C. Syme

OBJECTIVES:

The primary objective of this project is to provide an updated and detailed geological data base for future base metal and gold exploration in the Flin Flon-Athapapuskow area. To that end, specific goals include: 1) production of high quality 1:20 000 geological maps, 2) definition of Amisk Group volcanic stratigraphy, 3) definition of stratigraphic and structural setting of mineral occurrences, 4) definition and extension of the major faults and folds which dominate the structure in the Flin Flon area, 5) thorough documentation of all mafic and felsic plutons, 6) geochemical characterization of volcanic and plutonic rocks with a view to furthering our knowledge of Proterozoic magma genesis, and 7) geochronology of Amisk Group and plutonic rocks.

PROGRESS:

In 1987 a full field season was spent mapping Amisk Group rocks in the Athapapuskow Lake portion of the area. Selected volcanic and intrusive units have been analyzed for major, minor, trace and rare earth elements.

PRODUCTS:

Results of this year's work are summarized in Report of Field Activities 1987 - GS-7: Athapapuskow Lake Project - accompanied by 1:15 840 scale Preliminary Maps 1987F-1 and 1987F-2.

FOLLOW-UP AND IMPLICATIONS:

Another field season will be spent mapping in the area in 1988. Preliminary maps and a report summarizing the summer's findings will be given in the 1988 Report of Field Activities. This project will build upon the stratigraphic and structural base now established in the Flin Flon area (Bailes and Syme, in prep.) to provide a better understanding of the western Flin Flon-Snow Lake metavolcanic belt.

PROJECT 1.5.4: 1:20 000 scale geological mapping, Chisel Lake-Morgan Lake area

INVESTIGATOR: A.H. Bailes

OBJECTIVES:

The objective of this project is to provide a much improved geological data base for future mineral exploration in this base metal- and gold-rich mining district. A major goal is the development of a coherent regional volcanic stratigraphy and the identification of the position of mineral deposits within this stratigraphic framework. A further goal is to document the distribution and main characteristics of hydrothermal alteration zones associated with known and, as yet, undiscovered mineralized zones. Where possible, the environmental conditions that existed at the time of mineralization will be identified with a view to determining those conditions favourable to deposition of mineral deposits.

PROGRESS:

In 1987 approximately 75 km^2 of the Chisel Lake-Morgan Lake area was mapped during a three month field season. Most activities were directed towards production of a preliminary map (1987S-1) and a written contribution to the 1987 Report of Field Activites (GS-12).

Mapping has demonstrated that the eastern two-thirds of the area consists of a folded, dominantly north-facing, 5 km thick sequence of volcanic rocks in which known massive sulphide deposits occur near the base, middle and top of the section. The western third of the area is structurally and stratigraphically more complex. A number of synvolcanic felsic plutons have been identified and it appears that hydrothermal alteration and deposition of massive sulphide deposits were probably related to emplacement of these plutons.

PRODUCTS:

In 1987, a preliminary map (1:15 840 scale) and a report (GS-12), in the 1987 Report of Field Activities, were published. An oral presentation on the results of this project was given at CIM meetings in Snow Lake and Flin Flon (April), at the Annual GAC/MAC meeting in Saskatoon (May) and at the November Open House, in Winnipeg. Some results of this project were published in a field trip guidebook (Trip #1, 1987 GAC-MAC Annual Meeting, Saskatoon).

FOLLOW-UP AND IMPLICATIONS:

In 1988, the 1:15 840 mapping of the Chisel Lake-Morgan Lake area will be completed during a one month field season. Results of this mapping will be

released as a preliminary map and in 1988 Report of Field Activities.

Mapping in the area will significantly upgrade the existing geological data base, such that future exploration can proceed in a rational and productive manner.

PROJECT 1.5.5: Tartan Lake mapping

INVESTIGATOR: H.P. Gilbert

OBJECTIVES:

To provide an up-to-date detailed geological data base in the northwestern part of the Flin Flon belt in well exposed areas of known and potential gold and base metal mineralization.

PROGRESS:

Mapping of supracrustal rocks between Tartan Lake and Embury Lake is substantially completed. Fifty-two volcanic rocks have been geochemically analyzed.

PRODUCTS:

Preliminary Map 1987F-3: Tartan Lake-Lac Almée 1:15 840.

Report (GS-8) in Report of Field Activities 1987.

FOLLOW-UP AND IMPLICATIONS:

Mapping at 15 840 in 1988 will be completed to the provincial boundary to provide complete coverage of the western part of the Flin Flon belt in connection with Projects 1.5.1, 1.5.2 and 1.5.3. Investigation of the Tartan Lake gabbro complex and geochemical sampling will be continued.

PROJECT 1.6.1: 1:50 000 scale geological mapping of the Kississing Lake area

INVESTIGATOR: D.C.P. Schledewitz

OBJECTIVES:

The objective is to establish the lithology, stratigraphy and structure of the Kisseynew gneisses at Kississing Lake and to relate the various types of mineralization in the area to these parameters. Once a systematic, comprehensive geological base for the Kississing Lake area has been established, a major objective is to compare this geology to that of the Sherridon Group and the mineral occurrence within the Sherridon Group at the type locality around Sherridon.

PROGRESS:

Fieldwork concentrated on the east half of Kississing Lake area in 1987.

PRODUCTS:

Two preliminary maps at 1:20 000 scale covering the Kississing Lake area and a report with compilation map and figures were produced as part of the Report of Field Activities, 1987.

FOLLOW-UP:

Continuation of mapping in 1988 along the eastern edge of the Kississing Lake map area. A preliminary map at 1:50 000 scale and an Open File Report dealing with the mineral potential, and lithostratigraphic considerations encompassing aspects of the geology of adjacent areas, including metamorphic, structural and igneous history, is projected for 1989.

IMPLICATIONS:

Preliminary results indicate extensive regional ductile shear has greatly modified the record of earlier geological events. Several types of mineralization occur in varied settings and their primary relationship with the host rocks may have been extensively modified by subsequent deformation and recrystallization.

PROJECT 1.6.2: Kisseynew East, geological mapping

INVESTIGATORS: H.V. Zwanzig and P.G. Lenton

OBJECTIVES:

The purpose of this project is to provide direction to base and precious metal exploration north of Flin Flon by establishing the stratigraphy, lithology, structure and mineral potential of geological formations east of Sherridon. Reliable geological data demonstrating stratabound or structural control of known mineral deposits will provide a basis to search for additional deposits.

PROGRESS:

The Moody Lake-Batty Lake-Limestone Point Lake area was remapped at 1:50 000 scale and Star Lake at 1:20 000 scale.

PRODUCTS:

Preliminary maps 1987K-3 (Limestone Point Lake) and 1987K-4 (Star Lake) and a preliminary report were produced as part of the Report of Field Activities 1987.

FOLLOW-UP AND IMPLICATIONS:

The Walton Lake-Martell Lake area will be remapped. Petrographic and structural work will be followed by an interim and final report and maps.

PROJECT 1.7: Scout drilling, Project Cormorant area

INVESTIGATORS: W. Weber, H.R. McCabe, W.D. McRitchie, I.T. Hosain and D. Berk

OBJECTIVES:

To assist in determining the geology of the Precambrian basement in an area of thin Phanerozoic sedimentary cover, by means of an in-house diamond drilling core hole program. This program is designed to ground-truth geophysical signatures detected by the airborne gradiometer surveys of the Cormorant area.

PROGRESS:

During the 1987 field season, a three-man drill crew, using a truck-mounted JKS-300 diamond drill rig, completed a total of 8 vertical holes into Precambrian basement, on targets defined on the basis of airborne gradiometer maps. Prior to drilling, detailed ground magnetometer profiles were run at each site to determine the precise core hole location in respect to the airborne magnetic data. Core from 55 company drill holes was re-examined to establish a legend for a geological map of the sub-Paleozoic-Precambrian. Total Precambrian drilled was 170 m. One U-Pb zircon age was derived from the central batholithic domain.

PRODUCTS:

Oral presentation and abstract at GAC-MAC 1987 annual meeting.

One short publication in Geoscience Canada to be published in 1988.

Report in Report of Field Activities 1987.

FOLLOW-UP AND IMPLICATIONS:

Six additional holes to be drilled in 1988, and the drill holes and geological interpretation undertaken by the GSC should allow for production of a 1:250 000 scale geological map of the sub-Paleozoic Precambrian. The resultant map will be useful for mineral exploration, and a significant improvement on earlier drafts.

PROJECT 2.7: Gold deposits, Snow Lake area

INVESTIGATOR: M.A.F. Fedikow

OBJECTIVES:

To determine the geological controls of gold deposits in the Snow Lake area.

To establish the nature and genesis of those gold deposits and investigate possible exploration methodology for detecting similar types of gold mineralization.

PROGRESS:

The preliminary examination of gold occurrences in the Snow Lake area has been completed. In the following two years it is expected that more detailed studies on selected gold occurrences will be started. Selected occurrences will be examined in the area of the Herblet and Pulver gneiss domes.

PRODUCTS:

The preliminary findings, stemming from field examinations in 1984, 1985 and 1986, are presented in the Report of Field Activities. Detailed occurrence locations, geological maps and assay and geochemical results are available for inspection in a mineral deposit open file. Mineral deposit maps for the Snow Lake area, utilizing this information, are in preparation.

FOLLOW-UP AND IMPLICATIONS:

Detailed mineral occurrence studies on specific occurrences will commence with the completion of preliminary examinations in 1988. Progress reports describing the new findings will be released in the Report of Field Activities and in open file reports so that mining and exploration companies will be able to utilize relevant mineral occurrence information.

PROJECT 2.9: Mineral occurrence documentation - Flin Flon area

INVESTIGATOR: G.H. Gale

OBJECTIVES:

This project is designed to provide detailed geological maps and descriptions of all known mineral occurrences in the Flin Flon area, provide a genetic classification of deposits, and delineate geologically favourable mineralized zones on 1:50 000 scale and 1:20 000 scale maps for further investigations.

PROGRESS:

Over 95% of the mineral occurrences in the 63K/11, 63K/12, 63K/13 and 63K/14 map sheets have been investigated in a preliminary manner with documentation of basic rock types and mineral deposit features. In 1987 detailed studies of specific deposits involved two weeks of field work on the Tartan Lake and Baker Patton deposits.

PRODUCTS:

An active mineral deposit file for each occurrence contains detailed geological maps, accurate locations, and assay and rock geochemical data. Mineral Deposit map and report for 63K/13SE were completed as Mineral Deposit Series, Report No. 1.

FOLLOW-UP AND IMPLICATIONS:

Investigations of specific deposits will continue for several years as new geological problems are identified. This work will entail detailed mapping at scales of 1:1000 and 1:5000. It is anticipated that each major deposit study (i.e. 1:5000 scale studies such as the Tartan Lake investigation), will result in an open file report as soon as the data are available to ensure quick release to the mining and exploration community.

PROJECT 2.10: Kisseynew sedimentary gneiss terrain

INVESTIGATOR: G. Ostry

OBJECTIVES:

To provide a mineral deposit data base, identify geological factors controlling mineralization, and classify mineral occurrences into genetic types.

To establish the stratigraphic position of mineralization and determine stratigraphy on the

southern flank of the Kisseynew sedimentary gneiss terrain.

To identify specific metallotects for further investigations.

PROGRESS:

Mineral deposit documentation has been completed in the Batty and Wood Lakes area. Mineral deposit maps for NTS 63K/16, 63N/2, 3 and 4 are in preparation. Detailed 1:5000 scale mapping was continued in the vicinity of the Puffy Lake gold deposit, and initiated in the vicinity of the Wood Lake gold occurrence.

PRODUCTS:

Descriptions of mineral occurrences in the Batty Lake and Wood Lake areas of the Kisseynew gneiss terrain are contained in Report GS-15 in the Report of Field Activities 1987. Individual files containing detailed maps, assay/geochemical results, and written descriptions have been produced for each documented occurrence.

FOLLOW-UP AND IMPLICATIONS:

Further detailed mapping will be carried out in selected areas to define the overall stratigraphy on the southern flank of the Kisseynew sedimentary gneiss terrain and the position(s) of mineralization within that stratigraphy. Thin section work and lithogeochemical sampling will continue to classify the rock types encountered and, in particular, the amphibolites which appear to be spatially related to the known stratabound mineralization. Both laboratory and field data will be synthesized to develop genetic models for the Kisseynew-type stratabound precious and base metal mineralization and precious metal mineralization controlled by structures. Effective mineral exploration techniques for precious and base metal mineralization will evolve from the development of these genetic models and an understanding of the factors controlling the mineralization on the southern flank of the Kisseynew sedimentary gneiss terrain.

PROJECT 2.11: Industrial minerals investigations, Flin Flon-Snow Lake region

INVESTIGATORS: W.R. Gunter

OBJECTIVES:

The purpose of this project is to evaluate reported occurrences of building stone, sillimanite, and garnet in the Flin Flon-Snow Lake area. The deposits will be sampled to determine the suitability of the material for industrial mineral use, and those deposits indicating potential will be examined in more detail. Additional examinations will take the form of detailed mapping, sampling and possibly diamond drilling.

PROGRESS:

Property evaluations in the Flin Flon-Snow Lake region have been undertaken on: (1) garnet-anthophyllite units at Molly Lake; (2) dolomite deposits in the Wekusko-Cranberry Portage area; (3) black granite at Cross Lake; (4) anorthosite at Cross Lake; and (5) granite and porphyry near Flin Flon.

PRODUCTS:

A preliminary report (GS-17) in the 1987 Report of Field Activities describes the findings in the Flin Flon-Snow Lake area. A second product is an increased awareness of the value of industrial minerals among the geologists of the region. Several inquiries from the public have been received concerning Cross Lake black granite as a facing stone, garnet from Star Lake-Elken Lake for water filtration, and sillimanite from this deposit as a refractory raw material.

Initial results warrant continuation of this project.

FOLLOW-UP AND IMPLICATIONS:

A detailed study of the garnet-anthophyllite unit at Star Lake-Elken Lake, is being undertaken as an M.Sc. thesis. A study of the building stone potential of granites in the Flin Flon area and talc at Iskwasum Lake will be commenced in 1988.

PROJECT 2.12.2: Geological setting, Vamp Lake deposit

INVESTIGATORS: P. Laznicka, R. Wadlen (U. of Man.); (G.H. Gale, MGSB)

OBJECTIVES:

To provide a detailed geological description and interpretation of the gold-bearing massive sulphide deposit at Vamp Lake.

PROGRESS:

Geological mapping at 1:10 000 of the general area was completed in 1985. Portions of the area were remapped in 1986. Petrographic and geochemical studies are completed. A first draft of the M.Sc. thesis was submitted in December, 1987.

PRODUCTS:

Geological map at 1:10 000 scale.

Year-end technical report (1986-87) was received in June 1987.

FOLLOW-UP AND IMPLICATIONS:

M.Sc. thesis completion is expected in 1988.

PROJECT 2.24: Copper-zinc deposits, Snow Lake area

INVESTIGATOR: M.A.F. Fedikow

OBJECTIVES:

To ascertain stratigraphic and structural controls of rock sequences hosting known copper-zinc deposits in the Snow Lake area.

To establish the nature and genesis of those copper-zinc deposits and investigate possible exploration methodology for detecting previously unknown copper-zinc mineralization.

PROGRESS:

Mineral deposit documentation is complete in the Snow Lake area of the Flin Flon-Snow Lake greenstone belt.

PRODUCTS:

Mineral deposit maps for the Snow Lake area are in preparation.

Detailed geological mapping and geochemical sampling have been undertaken in the vicinity of most of the occurrences examined to date. An extensive geochemical data base is being developed for these occurrences and includes assay and geochemical analyses from the mineralized zones and host rock sequences. A regional rock geochemical sampling program will be continued and is designed to determine background geochemical concentrations of a wide range of trace elements in major lithologies of the area.

Preliminary findings have been described in the 1984, 1985 and 1986 Reports of Field Activities. A mineral deposit open file is available for inspection and contains the location of each mineral occurrence plotted on an airphoto. Accompanying detailed sketch maps and assay results complete the file to date.

FOLLOW-UP AND IMPLICATIONS:

The 1987 field season has resulted in the completion of the examination of mineral occurrences in the Snow Lake area. More detailed examinations of mineral occurrences are expected to continue for several years in an attempt to define metallotects. As these detailed projects evolve, findings will be released in the form of open file reports, including any detailed mapping, so that mining and exploration companies will have quick access to relevant, up-to-date information. The project, which is designed to determine background geochemical concentrations for rocks in the Snow Lake area, will be continued in 1988.

PROJECT 2.30: Mineral deposit geology - Flin Flon

INVESTIGATOR: G.H. Gale

OBJECTIVES:

To establish the geological setting and origin of selected mineral occurrences in the Flin Flon area.

PROGRESS:

One week of detailed mapping was undertaken at the Baker Patton deposit.

PRODUCTS:

Preliminary geological map at 1:2000 scale.

FOLLOW-UP AND IMPLICATIONS:

Detailed mapping will be extended; geochemical surveys will be completed with eventual inclusion in an open file report.

PROJECT 2.31: Metallogeny of felsic intrusive rocks

INVESTIGATORS: N.M. Halden (U. of Manitoba);
G.H. Gale (MGSB)

OBJECTIVES:

To establish the metallogeny and genesis of felsic intrusive rocks in the Flin Flon-Snow Lake greenstone belt, Manitoba and to establish a geochemical data base for felsic intrusive rocks in the Flin Flon-Snow Lake greenstone belt.

PROGRESS:

Samples have been prepared for analysis using fused beads and powdered briquettes. Analyses for major elements are completed.

PRODUCTS:

A total of 350 major element analyses. Report in 1987 Report of Field Activities.

FOLLOW-UP AND IMPLICATIONS:

A geochemical report synthesizing the geochemical data will be prepared in 1988. A two-week field season will be undertaken by N.M. Halden to evaluate further studies. M.Sc. studies have been postponed to a later date.

GEOLOGICAL SURVEY OF CANADA:

PROJECT C.1.1.1: Metamorphosed alteration zones

INVESTIGATORS: E. Froese (GSC/LCSD);
E. Zaleski, M. Leroux (U. of Manitoba)

OBJECTIVES:

To investigate and describe the mineralogy of hydrothermal alteration zones associated with metamorphosed massive sulphide deposits.

PROGRESS:

Edgar Froese (GSC) completed field investigations of altered rocks in the Wolverton Lake area. The dominant type of alteration is represented by the assemblage garnet-cordierite-anthophyllite. Aluminous rocks, marked by the presence of cordierite-sillimanite and biotite-rich rocks are less common. Petrographic studies of surface samples and drill core, made available by Hudson Bay Exploration and Development Company, are in progress. As part of a cooperative project with Mark Fedikow of the Manitoba Geological

Services Branch, Edgar Froese examined thin sections of drill core from the Cook Lake alteration zone, made available by Falconbridge Ltd.

Eva Zaleski completed detailed mapping in the vicinity of the Linda deposit and logging of drill core, made available by Minnova Inc.. A doctoral thesis on the geochemistry and mineralogy of the Linda deposit is in progress at the University of Manitoba.

Mark Leroux collected samples from the Star Lake garnet-cordierite-anthophyllite occurrence and is completing an M.Sc. thesis on the mineralogy of these rocks at the University of Manitoba.

PRODUCTS:

Froese, E., 1987: GSC-1 Metamorphosed alteration zones (C.1.1.1); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 168.

Zaleski, E. and Halden, N., 1988: Reconstruction of synvolcanic alteration associated with the Linda massive sulphide deposit, Snow Lake, Manitoba; in Current Research, Part C, Geological Survey of Canada, Paper 88-1C, P. 73-81.

M. Leroux presented a poster on his work at the Manitoba Meeting with Industry, 1987.

FOLLOW-UP AND IMPLICATIONS:

Zaleski has completed her field work, and over the next year will be completing laboratory studies for the thesis (N. Halden, advisor). Froese will be completing the Cook Lake report with Fedikow (MGSB), and continuing his work on the Wolverton Lake project. Leroux will be completing his thesis study in May 1988 (N. Halden, supervisor).

It is hoped that the alteration studies completed during this five year period will form the basis for successor studies on the spatial and genetic relationships between synvolcanic alteration and massive sulphide deposits.

PROJECT C.1.1.3 Geochronology of the Churchill Province

INVESTIGATORS: T.M. Gordon (GSC/LCSD),
P.A. Hunt (GSC/LCSD)

OBJECTIVES:

To sample selected areas for subsequent zircon U/Pb work that will assist geoscience workers in the Trans-Hudson Orogen to better understand the magmatic and metamorphic evolution of these rocks. Work completed over the time of the MDA agreement will complement other GSC projects, and will be arranged in consultation with Manitoba.

PROGRESS:

Two new U/Pb ages were calculated from samples collected to date. A rhyolite crystal tuff from the Amisk Group in the Flin Flon area was dated at 1886 ± 1.3 Ma, and the Lynx Lake Pluton in the Athapapuskow area was dated at 1847 ± 4 Ma. More samples were collected this year from the Flin Flon and Snow Lake areas in order to further contrain the age of the Amisk Group in the Flin Flon-Snow Lake Belt.

PRODUCTS:

Gordon, T.M., 1987: GSC-3: Geochronology of the Churchill Province (Project C.1.1.3); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 168.

Gordon, T.M., Hunt, P.A. Loveridge, W.D., Bailes, A.H. and Syme, E.C., 1987: U/Pb zircon ages from the Flin Flon and Kisseynew belts, Manitoba: chronology of Early Proterozoic crust formation; GAC/MAC Joint Annual Meeting, Program with Abstracts, v. 12, p.48.

FOLLOW-UP AND IMPLICATIONS:

Sampling will continue in the next fiscal year within some of the more inaccessible regions of the Flin Flon-Snow Lake belt. Processing of samples taken from the last field season will continue.

The differentiation between synvolcanic and syntectonic plutons in the belt, by age dating, will allow industry to refine their target areas for base metal exploration. The larger scale implications of this program include a better understanding of the magmatic and metamorphic history of the Trans-Hudson Orogen.

PROJECT C.1.2.1: Project Cormorant; Interpretation of sub-Phanerozoic geology

INVESTIGATORS: B.B. Blair (GSC/LCSD), J. Dugal (GSC/LCSD), L.J. Kornik (GSC/LCSD), T.M. Gordon (GSC/LCSD)

OBJECTIVES:

To investigate, map, and interpret Precambrian geology beneath Paleozoic cover rocks adjacent to the edge of the exposed Shield. The project involves geological compilation, modelling of geophysical anomalies, correlation with exposed surface geology, geological synthesis of basement geology, selection of targets for drilling, logging of already available and new drill core, and production of the final synthesis. The GSC will be responsible for drilling in areas not accessible from roads. All of the above will be done in close consultation with the Manitoba Geological Services Branch.

PROGRESS:

The Geological Survey of Canada carried out a diamond drill program during the winter of 1987 to aid in compiling a 1:250 000 scale map of the sub-Phanerozoic geology of the Cormorant map sheet (NTS 63K). The results were made public at an oral presentation to the GAC/MAC Annual Meeting in Saskatoon (May, 1987) by Bruce Blair (GSC), on the work carried

out by Blair, Les Kornik (GSC) and Terry Gordon (GSC). The summer field season was spent by Blair relogging core drilled from 51 holes by exploration companies in the map area.

The 1987 drill program consisted of ten holes with a total of 610.35 m of core recovered. The drill sites targeted different magnetic domains as interpreted from the airborne vertical gradient and total field magnetic surveys. The drilling of magnetic highs revealed mafic and magnetite-bearing intermediate intrusive rocks. A distinct layering or zonation is observed in these bodies from their geophysical signatures. A series of biotite-hornblende-epidote gneisses were discovered within a strongly linear domain of low magnetism on the northern flank of the large central granitoid domain.

Beginning in November 1987, an agreement was reached with the Manitoba Geological Services Branch to outfit their scout drill for winter operations. This will allow for the completion of up to ten new holes in the southern portion of 63K, during the spring of 1988.

PRODUCTS:

Blair, B.B., Kornik, L.J. and Gordon, T.M., 1987: Sub-Phanerozoic geology of the Cormorant Lake map area: interpretation based on airborne gradiometer surveys and drill core data; in Program with Abstracts, v. 13, GAC/MAC Joint Annual Meeting, p. 25.

Blair, B.B., 1987: GSC-5: Project Cormorant: Interpretation of sub-Phanerozoic geology (C.1.2.1); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 168.

Blair and Kornik presented a poster display at the Manitoba Meeting with Industry, 1987.

PROJECT C.2.1.1: Flin Flon-Snow Lake metallogeny

INVESTIGATORS: A.G. Galley (GSC/MRD), J.M. Franklin (GSC/MRD)

OBJECTIVES:

To obtain an understanding of controls in gold and massive sulphide deposits, with an emphasis on alteration, structure, petrology and isotope geochemistry. The project represents a continuation of existing studies and will involve: regional setting of gold mineralization in light of the tectonic history of the area and, examination of alteration associated with volcanogenic massive sulphide deposits.

PROGRESS:

During the 1987 field season, eight weeks were spent in the Snow Lake-Wekusko Lake and Elbow Lake regions. In the Snow Lake area, Galley (GSC) spent two weeks finishing a 1:5000 scale study of the area around the town of Snow Lake. This area contains the Nor Acme Mine (now being dewatered), and Snow Lake Mines Ltd. Main Zone (now exposed by a large pit).

Franklin (GSC) and Galley, spent two weeks along the east shore of Wekusko Lake completing 1:2000 scale mapping of the Rex-Laguna property and the area around "Herbtown" in order to further define controls on gold mineralization in the area. Shoreline traverses were also completed from Crowduck Bay south to the mouth of Puella Bay in order to further define the character of the Crowduck Bay Fault, and its relation to the structurally controlled gold deposits.

In the Elbow Lake region, a 1:20 000 scale analysis of the geological setting of gold in the area was completed by Galley and Ames (GSC).

R. Skirrow (Carleton U.) completed his MSc. on the deep footwall alteration to the Chisel massive sulphide deposit. A. Gulley completed a Bsc. thesis on the mineralogy of the Snow Lake Mines Ltd Main Zone.

PRODUCTS:

Balles, A.H., Syme, E.C., Galley, A.G., Price, D.P., Skirrow, R. and Ziehlke, D.V., 1987: Early Proterozoic volcanism, hydrothermal activity, and associated ore deposits at Flin Flon and Snow Lake, Manitoba; Geological Association of Canada Field Trip Guide Book #1, 95 p.

Galley, A.G., Ames, D.E. and Franklin, J.M., 1988: Geological setting of gold mineralization at Snow Lake, Manitoba: a preliminary 1:5000 scale map with accompanying notes; Geological Survey of Canada, Open File 1700.

Galley, A.G., 1987: Flin Flon-Snow Lake metallogeny (Project C.2.1.1); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 169.

Galley, A.G., Ames, D.E. and Franklin, J.M., 1987: Geological setting of gold mineralization in the Elbow Lake region, Manitoba: a 1:20 000 scale preliminary map; in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division.

Galley, A.G., Ames, D.E. and Franklin, J.M., 1987: Geological setting of mineralization in the Elbow Lake region, Manitoba; in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 175-177.

Galley, A.G., 1987: Petrography of the Snow Lake Mines Ltd. Main Zone gold deposit; B.Sc. thesis (unpubl.), Queen's University, Kingston.

Skirrow, R.G., 1987: Silicification in a semiconformable alteration zone below the Chisel Lake massive sulphide deposit, Manitoba; M.Sc. thesis (unpubl.), Carleton University, Ottawa, pp. 170.

Poster presentation at the Manitoba Meeting with Industry, 1987.

FOLLOW-UP AND IMPLICATIONS:

During the next fiscal year, Skirrow's thesis results will be open filed, and also combined with data col-

lected by Franklin on the Anderson Mine alteration for a future publication.

Detailed analysis of the data collected from Snow Lake, Wekusko Lake and Elbow Lake will be completed, with the results published in the next fiscal year as part of a volume on gold metallogeny of the Southern Churchill Province.

It is hoped that the results of the massive sulphide and gold studies will lay the groundwork for future studies of the characteristics of synvolcanic alteration and the structural control of gold deposits within the Flin Flon Belt.

PROJECT C.2.1.1: Metallogeny of mafic-ultramafic rocks: Flin Flon-Snow Lake belt

INVESTIGATORS: J. Young, L. Ayres (U. of M.), R.F.J. Scoates (GSC/MRD)

OBJECTIVES:

To characterize mafic-ultramafic bodies in the Flin Flon-Snow Lake area with emphasis on their potential to host magmatic sulphide (Ni-Cu-PGE) and oxide (Cr-Ti-V) mineralization. The first phase will involve mapping, sampling and petrological characterization of the major bodies in the belt over a two year period. The second phase will include more detailed studies of selected bodies and mineralization. The first phase is being undertaken under contract to the University of Manitoba.

PROGRESS:

Field work on this project was completed under contract to Lorne Ayres of the University of Manitoba, under the supervision of Jon Scoates (GSC), with data collected on the chemistry and internal stratigraphy of several of the important mafic-ultramafic intrusions within the belt. Jeff Young, a graduate student with the Department of Geological Sciences, is now in the process of completing a comprehensive report on the results of the study. Samples collected during the study are being selectively analyzed for platinum group element concentrations.

PRODUCTS:

Scoates, R.F.J., 1987: GSC-9: Metallogeny of mafic-ultramafic intrusions: Flin Flon-Snow Lake belt; in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 170.

FOLLOW-UP AND IMPLICATIONS:

A report on the internal stratigraphy and petrochemistry of selected layered intrusions will be open filed by March 31, 1989. The definition of the internal stratigraphy of these intrusions will allow exploration companies to be more selective in their approach when investigating these bodies for related mineralization.

PROJECT C.2.2.2: Metallogeny of mafic-ultramafic rocks: Northern Churchill

INVESTIGATORS: L. Hulbert (GSC/MRD)

OBJECTIVES:

To characterize mafic-ultramafic bodies with emphasis on their potential for magmatic sulphide (Ni-Cr-PGE) and Oxide (Cr-Ti-V) deposits. One component will provide data on the platinum metal concentrations in known mineralization; another will document the character of some mineralized mafic-ultramafic bodies.

PROGRESS:

Larry Hulbert (GSC) completed field studies last season in which selected intrusions were examined within the Lynn Lake-Rusty Lake belts and in the Kisseynew gneiss belt for their platinum group element, nickel-copper and titanium potential. Nd/Sm and Rb/Sr have been obtained from the intrusions; comparison of the two different types of age determination indicates that the Nd/Sm method is by far the more accurate in relation to primary ages. Nd/Sm ratios also corroborate S/Se ratios with respect to indicating the presence of crustal contamination within certain mafic-ultramafic intrusions. These contaminated intrusions appear to contain low concentrations of platinum group elements. Laboratory work is continuing in order to further define chemical signatures that would allow mafic-ultramafic intrusions to be screened for mineral potential.

PRODUCTS:

Hulbert, L., 1987: GSC-10: Metallogeny of mafic-ultramafic rocks: Northern Churchill; in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p.170.

FOLLOW-UP AND IMPLICATIONS :

Many of the results of this study will be combined with Hulbert's work in the Trans-Hudson Orogen of Saskatchewan in order to give an overview of the characteristics of Proterozoic mafic-ultramafic intrusions. These results will be published in scientific journals, and possible open filed by March 31, 1989.

Researching new methods to discriminate between intrusions, and the dating and classification of these bodies using techniques easily adopted by exploration companies will allow for an accelerated evaluation of their mineral potential.

PROJECT C.3.1.1: Gradiometer surveys

INVESTIGATORS: E.E. Ready (GSC/GEOPH)

OBJECTIVES:

To provide complete high resolution aeromagnetic gradiometer maps, VLF profile data or EM data for areas selected in conjunction with the provincial sur-

vey. The work will be contracted out and supervised by the GSC.

PROGRESS:

Airborne gradiometer surveys were not flown this year. An INPUT survey has been completed in the Lynn Lake region by Geoterrex. Results should be available by the early summer.

Results of the gradiometer survey flown over the Sherridon-Nokomis region were released in May 1987 (GSC OF 1478) as open file 1:20 000 vertical gradient and total field sets. Survey results from the Root Lake (63K/3 cdef, 63K/4, 63K/5 abcdef, 63K/6 cd), and Flin Flon (63K/12 cdef, 63K/13 cdef) areas were released in November, 1987.

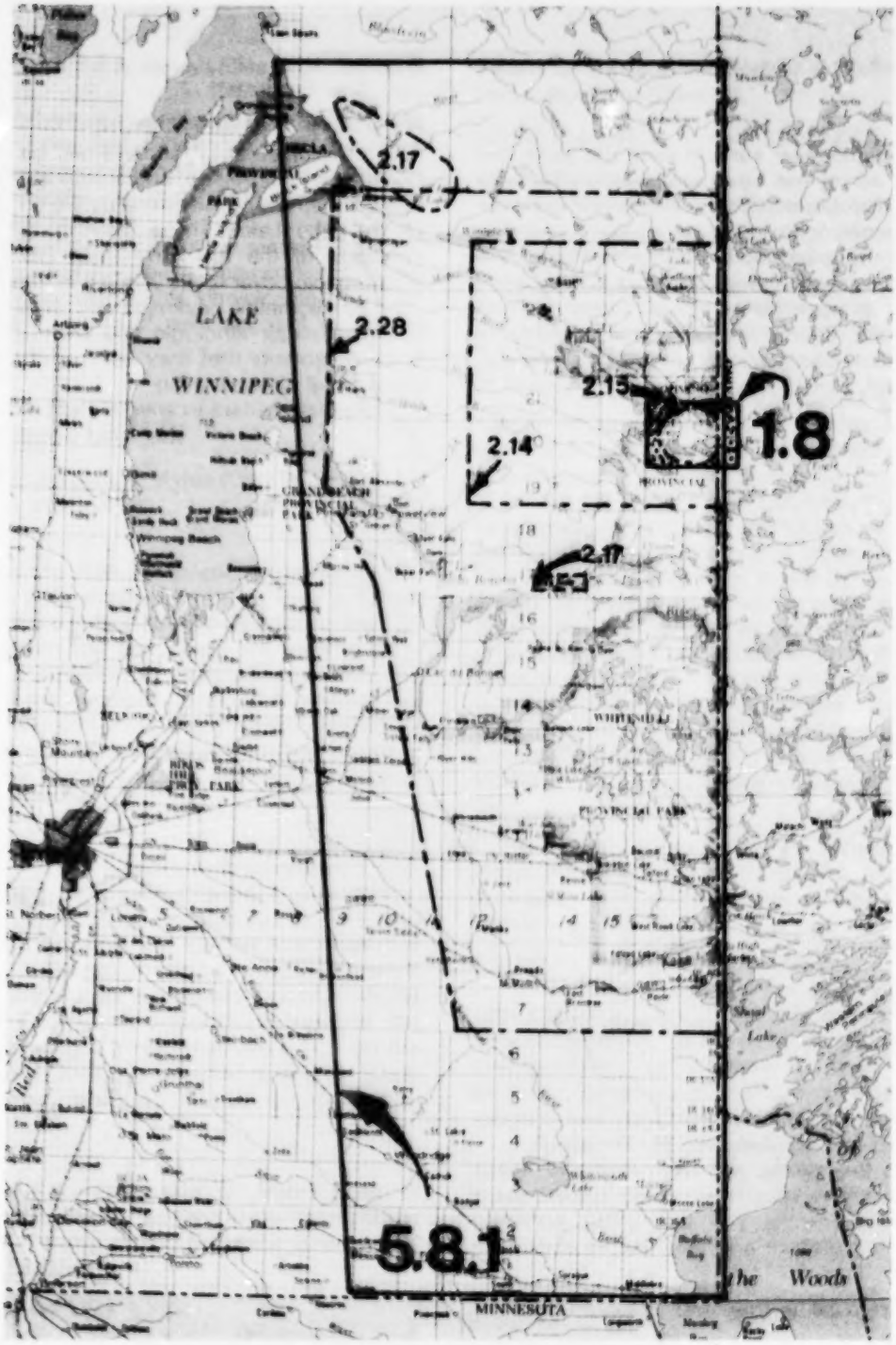
PRODUCTS:

See "Progress".

FOLLOW-UP AND IMPLICATIONS:

Gradiometer/VLF surveys will be flown over the Cormorant Lake region, and a strip along the Flin Flon-Snow Lake/Kisseynew boundary from File Lake to east of Wekusko Lake. These surveys will complete the coverage of the Flin Flon-Snow Lake belt and the Phanerozoic cover rocks within 63K and parts of 63J.

Gradiometer coverage will allow geologists to delineate major lithologic and tectonic domains, and large lineaments that may be spatially related to precious metal mineralization.



1.8: Rice Lake geological mapping
2.14: Deposit documentation, Rice Lake area
2.15: Mineral Deposit Studies, Rice Lake
2.17: Platinum group element evaluation
2.28: Dimension stone resources assessment
5.8.1: Geological compilation

Figure 9: Provincial Sector A projects (1987) - District III: Southeast Manitoba.

DISTRICT III: SOUTHEAST MANITOBA

Summary:

MANITOBA GEOLOGICAL SERVICES BRANCH:

Geological mapping and minerals programming in the Bissett region continues to focus on the long established gold potential of the belt with specific emphasis on new environments for gold deposition. Known deposits are being studied and documented in detail but an important emphasis will also be placed on geological work in up-to-now unexplored, potentially new environments for gold (and base metal) deposits, such as stratabound mineralization. Programs are directed toward intensive sampling and geochemical assays of specific deposit types in the Wallace Lake, Stormy Lake and Gem Lakes areas.

Several mineral occurrences were examined in the Rice Lake region bringing documentation in this region to completion. Particular attention was given to gold-bearing quartz veins in a 2 km long stratigraphic unit at Lily Lake, and gold within arkosic rocks of the Edmunds Lake Formation.

Studies continued in the evaluation of Platinum Group elements in the English Lake and the Bird River Complex.

Industrial minerals activities concentrated on the continued evaluation of potential sites for dimension stone in southeast Manitoba.

A complex association of silicified pillow basalts, felsic pyroclastics, volcanic conglomerates, sandstones and argillites were encountered during detailed mapping of well burnt-over exposures in the Lily Lake area. Considerable lateral facies changes were documented from coarse proximal felsic pyroclastics to more distal sandstones. Gold-bearing veins appear to predate the development of major shear zones and their associated barren white quartz veins.

Placer gold occurrences in littoral Quaternary sand and gravel deposits in the Manigotagan region were investigated further. At this time the origin of the placer gold grains remains uncertain.

GEOLOGICAL SURVEY OF CANADA:

The study of the gold metallogeny of the Rice Lake region (Bissett) continued with the completion of a 1:10 000 scale map of the area. Detailed studies of the alteration associated with the San Antonio Mine and San Norm prospect, as well as other gold deposits and occurrences in the region, are continuing. Detailed structural analysis of the San Antonio deposit is complete, and structural studies on gold deposits in the Long Lake-Beresford Lake region were initiated.

Studies on the metallogeny of mafic-ultramafic intrusions continued on the Falcon Lake Stock and Bird River Sill, concentrating on the internal stratigraphy and gold mineralization in the former and on the stratigraphy and chromite-PGE potential of the latter.

Backhoe sampling of gold-bearing Lake Agassiz beach sands and underlying till at Manigotagan was completed in an effort to identify sedimentological controls on these placers.

PROJECT DESCRIPTIONS

MANITOBA GEOLOGICAL SERVICES BRANCH:

PROJECT 1.8: Rice Lake geological mapping

INVESTIGATOR: W. Weber

OBJECTIVES:

To undertake lithologic and structural mapping of geological environments with known or suspected potential for gold mineralization to improve targeting criteria for exploration.

PROGRESS:

The recently burnt-over Lily Lake area, south of Gem Lake, was investigated and in part mapped to determine criteria for formation of gold-bearing quartz veins.

PRODUCTS:

Report GS-20 in Report of Field Activities 1987.

FOLLOW-UP:

Further detailed mapping in the Wallace Lake area.

IMPLICATIONS:

The results will be of assistance to gold exploration companies presently active in the area.

PROJECT 2.14: Mineral occurrence documentation - Rice Lake greenstone belt

INVESTIGATOR: P. Theyer

OBJECTIVES:

This program will provide an inventory of all known mineral occurrences of the Rice Lake greenstone belt. This inventory will include data on the location, geology and mineral content of these occurrences. The information will provide an updated data base for the exploration of gold and other commodities in this area.

PROGRESS:

Investigation and documentation of approximately 130 mineral occurrences have been completed. Follow-up studies were conducted at Lily Lake. Selected occurrences were re-examined to fill in holes in the data base prior to report writing.

PRODUCTS:

Preliminary reports on the progress of this program were published in the Reports of Field Activities (GS-24, 1984; GS-28, 1985; GS-24, 1986; and GS-22, 1987).

FOLLOW-UP AND IMPLICATIONS:

Mineral deposit documentation was completed during the 1987 field season. Final reports and mineral deposit maps are in preparation.

PROJECT 2.15: Genesis of the Gatlan and related gold occurrences, Wallace Lake area

INVESTIGATORS: P. Theyer and R. Gaba (seasonal assistant)

OBJECTIVES:

The investigation of the Gatlan and related gold occurrences in the Wallace Lake area will provide information concerning the geology of the deposits, metal sources and concentrating mechanisms of the numerous smaller gold occurrences in this area. This study will provide guidelines for exploration designed to locate repetitions of this style of mineralization in the area.

PROGRESS:

Detailed investigations and sampling of the iron formations between Wallace Lake and Siderock Lake failed to identify the existence of significant gold concentrations or zones of sulphidization additional to those recognized in 1985. Field activities were cancelled in June 1986.

PRODUCTS:

The results of this work are published in Report of Field Activities 1986 (GS-24). M.Sc. thesis completed in January, 1988.

FOLLOW-UP AND IMPLICATIONS:

The Gatlan gold occurrence appears to be controlled by specific stratigraphic and tectonic components. The search for other areas with similar tectonostratigraphic features resulted in the discovery of previously unknown disseminated sulphides and free gold in iron formation between Wallace Lake and Siderock Lake.

PROJECT 2.17: Platinum group element potential, Bird River area

INVESTIGATOR: P. Theyer

OBJECTIVES:

The objectives of this program are: a) to establish the existence of platinum group elements in the Bird River Complex of southeastern Manitoba; and b) to investigate the geological controls and geographical extent of platinum group element mineralization in this complex.

PROGRESS:

Detailed sampling and mapping programs have identified anomalous platinum group element concentrations in several mineral occurrences on the northern flank of the Bird River Complex. The geological setting and character of the English Lake ultramafic rocks indicated that these rocks have the potential to contain platinum mineralization.

PRODUCTS:

Progress made in 1987 is described in GS-35, Report of Field Activities 1987.

FOLLOW-UP AND IMPLICATIONS:

The results of this program established the existence of significant platinum group element concentrations in both the ultramafic and the mafic rocks of the Bird River Complex. Current investigations of the petrology, mineralogy and the distribution of platinum group elements in the ultramafic part of the Chrome property and the English Lake ultramafic intrusion are expected to provide guidelines for a systematic search for platinum group elements in these igneous complexes.

PROJECT 2.28: Dimension stone resource assessment

INVESTIGATOR: B.E. Schmidtke

OBJECTIVES:

The purpose of this program is to evaluate the nature and extent of Manitoba's dimension and ornamental stone resources and to provide an inventory of materials with a potential for future development.

PROGRESS:

Road accessible outcrops of plutons in the Whiteshell Park with an average joint spacing greater than 2 m were mapped at a scale of 1:200. Two sites identified in the 1985 survey were drilled to determine horizontal joint spacing and the homogeneity of colour and texture at depth. Large samples were taken for the production of polished display slabs. Road accessible outcrops of potential flagrock deposits in the Rice Lake and Bird River supracrustal belts were sampled and documented.

PRODUCTS:

A preliminary report (GS-25) in Report of Field Activities 1987 describes the findings in southeast Manitoba. Occurrence files of sites documented in the 1986 survey have been compiled.

FOLLOW-UP AND IMPLICATIONS:

Geological mapping at 1:200 will continue in the Whiteshell Park and at potential flagrock sites in the Rice Lake and Bird River area. Strength tests were conducted on drill core from the 1986 and 1987 drilling and the data are being incorporated into a Geological Engineering undergraduate thesis.

PROJECT 4.1.1: Overburden investigations in the Manigotagan-English Brook area

INVESTIGATOR: E. Nielsen (MGSB),
R.N.W. DiLabio (GSC),
and E. Mongrain (U. of Ottawa)

OBJECTIVES:

To determine the origin of detrital gold found in glacial Lake Agassiz sediments near the Manigotagan airstrip.

PROGRESS:

Reconnaissance sampling up-ice from the Manigotagan airstrip resulted in 22 till and glacial samples being collected to find the source(s) of the gold.

An additional 66 sand and gravel samples were collected along the Manigotagan airstrip in an effort to find a method by which the gold was distributed in that area.

The reconnaissance till sampling produced a single till sample with 25 visible gold grains located directly up-ice from the Manigotagan airstrip. The gold grains will be microprobed and studied under the SEM to determine if they are similar to those discovered previously in the Lake Agassiz sediments.

PRODUCTS:

The sedimentology of the Lake Agassiz sediments at the Manigotagan airstrip is the subject of a B.Sc. (Hon.) thesis by E. Mongrain at the University of Ottawa.

FOLLOW-UP AND IMPLICATIONS:

Additional field work is not planned in this area.

The results of the study clearly established that detrital gold is present in Lake Agassiz beach deposits at the Manigotagan airstrip and in the till up-ice from the airstrip. The source(s) of the gold is unknown but probably lies in the English Brook-English Lake area.

GEOLOGICAL SURVEY OF CANADA:

PROJECT C.2.1.2: Structural and gold alteration studies, Rice Lake region

INVESTIGATORS: K.H. Poulsen (GSC/MRD),
D.E. Ames (GSC/MRD)

OBJECTIVES:

To examine regional and local features directly related to gold ore in the Rice Lake-Beresford Lake greenstone Belt within an approximately 100 km^2 map area centred on the San Antonio Mine. The study will assess: a) the relationship between gold-bearing structures and regional increments of deformation, b) recurring stratigraphic affiliations as a guide to ore, and c) the role of alteration (principally carbonatization) in the ore-forming process and its applicability as a guide to ore.

PROGRESS:

During the 1987 field season a 1:10 000 scale map of a 96 km^2 area centred on Rice Lake was completed by Ames (north half) and Galley (south half). This area can be divided geologically and geographically into northern, central and southern structural domains, with each containing known gold occurrences.

Detailed mapping of the sequence within the central domain, hosting the San Antonio and San Norm deposits, was completed this season. All of the elements of the San Antonio Mine stratigraphic sequence including the layered gabbroic rocks of the San Antonio Mine Unit, have been definitively traced north of Normandy Creek into the area of the San Norm deposit.

Deposit-scale carbonate alteration associated with the gold mineralization in the SAM Unit is being examined by Ames as part of an M.Sc. thesis. L. Diamond (Carleton U.) is examining aspects of gold-related alteration from occurrences in the Rice Lake and Beresford Lake regions. A structural analysis of the vein system at the San Antonio Mine by S. Lau (U. of Manitoba) has been completed as part of an M.Sc. study.

In addition to the mapping at Rice Lake, structural aspects of auriferous shear zones were examined in the Long Lake - Beresford Lake area by I. Derome (U. of Exeter) and R. Brommecker (U. of Waterloo).

PRODUCTS:

Poulsen, K.H., 1987: GSC-7: Structural and alteration studies, Bissett area (Project C.2.1.2); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 169.

Ames, D.E., Poulsen, K.H., Lau, S. and Brisbin, W.C., 1987: The San Antonio gold deposit, southeastern Manitoba; in Program with Abstracts, v. 12, GAC/MAC Joint Annual Meeting, p. 21.

Poulsen, K.H., and Robert, F., 1988: A comparison of structural style of three gold districts, Super-

ior Province, Central Canada; in Current Activities Forum 1988 Program with Abstracts, Geological Survey of Canada, Paper 88-1A.

Poster presentation at the Manitoba Meeting with Industry, 1987.

FOLLOW-UP AND IMPLICATIONS:

Field work under the present MDA will be completed in the Rice Lake region, and the study of the structural setting of gold deposits in the Long Lake-Beresford Lake region will continue.

Ames will complete her M.Sc. thesis in the upcoming fiscal year, and the various components of the project will be compiled into a report edited by Poulsen.

The studies carried out under this project will allow for a greater understanding of the relationship of gold deposits to regional tectonic events, and allow explorationists to further define potential target areas within the Superior Province.

PROJECT C.2.2.3: Falcon Lake Igneous Complex

INVESTIGATORS: W.C. Brisbin (U. of M.),
R.F.J. Scoates (GSC/MRD)

OBJECTIVES:

To investigate the petrology, stratigraphy, tectonic setting and precious metal mineralization of the Falcon Lake Intrusive Complex (FLIC). The stock hosts significant gold mineralization and an unconfirmed occurrence of platinum group elements.

PROGRESS:

Three Masters theses under the supervision of W.C. Brisbin and N. Halden (U. of M.) are underway on three different aspects of the intrusive complex. W. Mandziuk has completed his study of the internal structure of the complex, while P. Tirschmann is documenting the results of a petrochemical study. J. Fingler has completed field work on a study of gold mineralization related to the stock.

Most rocks are characterized by cumulate textures and primary igneous structures that include aligned minerals, steeply dipping concentric layering, scour structures, trough bands, angular and buttress unconformities, clots and mineral segregations, and numerous inclusions and xenoliths.

Whole rock chemical analyses have been completed on 125 samples collected for petrochemical study. On the basis of the available geochemistry, the rocks of the complex form a differentiated series of related rocks.

Four periods of gold mineralization within and in proximity to FLIC, are tentatively proposed on the basis of associated structural elements, composition of associated alteration, and the character of the mineralization. Early reports of the presence of PGE with Au in some mineralized occurrences cannot be substantiated by assays returned from sampling carried out during these studies.

PRODUCTS:

Mandziuk, W., Brisbin, W.C., and Scoates, R.F.J., (in press): Igneous structures in the Falcon Lake Intrusive Complex; The Canadian Mineralogist.

Scoates, R.F.J., 1987: GSC-11: Falcon Lake Igneous Complex (Project C.2.2.3); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p.170.

FOLLOW-UP AND IMPLICATIONS:

All three theses will be completed during the 1988-89 fiscal year. A compilation of the results of this project will be open filed before March 31, 1989.

The results of this study have resulted in a better understanding of the processes involved in the emplacement of this intrusive complex and its associated precious metal mineralization. This has a wide range of implications with respect to the emplacement of magmatic sulphides in relation to the internal stratigraphy of these complexes, and whether gold mineralization is coeval with the intrusion or hydrothermal and related to the tectonic rather than the intrusive event.

PROGRAM C.2.2.5: Bird River Sill

INVESTIGATORS: R.F.J. Scoates (GSC/MRD),
O.R. Eckstrand (GSC/MRD), J.M. Duke (GSC/MRD),
B.L. Williamson (GSC/MRD)

OBJECTIVES:

The project is designed to document the nature, distribution and origin of chromitite layers and subeconomic concentrations of platinum group element-bearing rocks in the Ultramafic Series of the Bird River Sill. Detailed maps, at a variety of scales, will illustrate significant elements of the sill stratigraphy.

PROGRESS:

Field and laboratory work continued on the Bird River Sill, concentrating on the Chrome Property where the most complete section of the sill is exposed. Field work this summer involved a total of 11 person months with up to 8 GSC personnel and summer students, and completes the most crucial field component of the current MDA program.

Mapping of the sill at 1:1000 scale was essentially completed, covering the full width of the sill and closely adjacent country rocks for 1 km of strike length (approximately 80 ha).

Mapping of the Chromitiferous Zone at 1:100 scale has been extended to complete coverage of 600 m of strike length. Mapping of the lower part of the

Ultramafic Series at 1:200 scale has been completed in the west end of the property for 200 m of strike length.

Channel sampling of the Ultramafic Series using diamond saws was completed, concentrating on stratigraphic intervals of known and potential PGE mineralization.

PRODUCTS:

Scoates, R.F.J., 1987: GSC-13: Bird River Sill (Project C.2.2.5); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 171.

Hulbert, L., Duke, J.M., Eckstrand, O.R., Lydon, J. and Scoates, R.F.J., 1988: Bird River Sill: in Geological environments of the Platinum Group Elements: notes for a workshop presented by the Geological Survey of Canada and sponsored by the Cordilleran Section, GAC, p. 45-52.

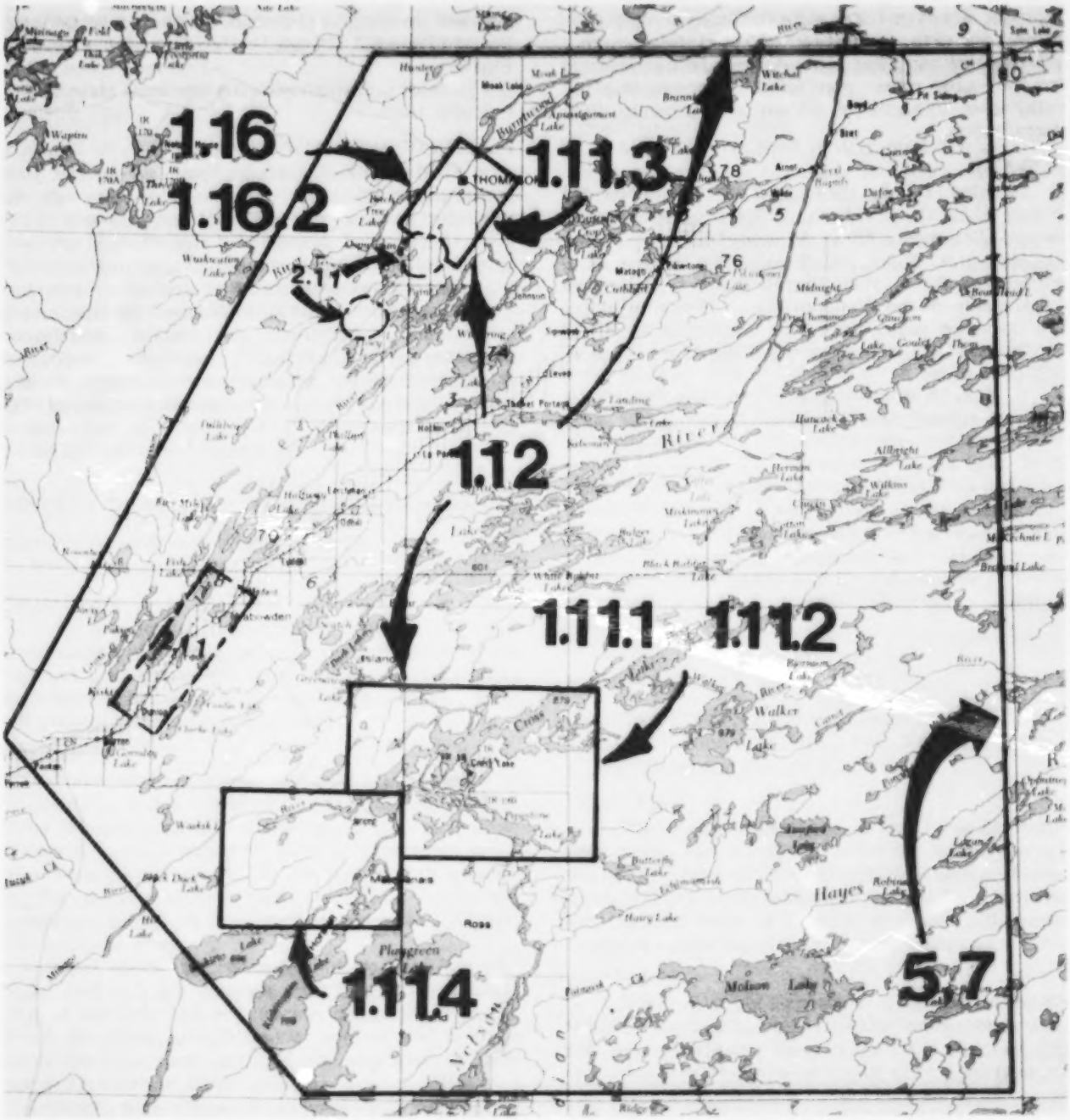
Scoates, R.F.J., Eckstrand, O.R. and Cabri, L.J., (in press): Interelement correlation, stratigraphic variation and distribution of PGE in the Ultramafic Series of the Bird River Sill, Canada; in Geo-Platinum '87 Volume. Elsevier.

Poster presentation at the Manitoba Meeting with Industry, 1987.

FOLLOW-UP AND IMPLICATIONS:

Field work will be completed during the 1988 season, and detailed maps and reports will be published as three open files by March 31, 1989.

The detailed mapping of the sill has led to a refinement of the Ultramafic Series stratigraphy, including recognition of a new zone of chromitite layers, and the effects of cross-faulting (which will be important in any future exploitation of potential stratabound chromite or PGE deposits), and has uncovered numerous examples of outcrop-scale synmagmatic disruptive features that may control concentration of PGE mineralization.



DISTRICT IV : THOMPSON

1.11.1 Cross-Pipestone Lake mapping
1.11.2 Titanium-vanadium evaluation (report production)
1.11.3 Thompson-Pipe mapping
1.11.4 Nelson River anorthosite evaluation
1.12 Uranium/Lead geochronological sampling
1.16 Rubidium-strontium isotope investigations
1.16.2 Thompon geochemistry
2.20 Rare-element enriched pegmatite evaluation
5.7 Thompson-Pikwitonei compilation

Figure 10: Provincial Sector A projects (1987) - District IV: Thompson.

DISTRICT IV: THOMPSON

SUMMARY:

MANITOBA GEOLOGICAL SERVICES BRANCH:

Much of the work in this region is evaluating the potential for diversifying the existing nickel-dependent mineral base. Projects focus primarily on known occurrences of iron, vanadium and titanium, and an evaluation of potential gold and platinum metallotects both in the Cross Lake greenstone, and gneissic Pikwitonei terrain.

In north-central Manitoba the industrial minerals evaluation focussed on marble at the Manasan Quarry and granite on Ospwagan Lake. A potential black granite source was identified at Cross Lake.

In the Thompson region detailed mapping of Pipe Pit lithologies, using low altitude high-resolution aerial photographs for a base, confirmed a Molson affinity for the diabase dykes and identified an early Hudsonian metamorphic and deformational event in the metasedimentary host rocks that predates dyke intrusion at 1884 Ma.

Mapping at 1:20 000 was completed in the central portion of Cross Lake, and the Pipestone Lake intrusive complex was extended to the west. Anorthosites near Jenpeg were also mapped and sampled. Northwest of the town of Cross Lake a single sample, from alteration haloes around quartz pods, assayed close to 6 gm/tonne Au.

Applied Geoscience Research agreements with the Department of Geological Sciences, University of Manitoba once again provided the means for focussing the unique expertise of university staff into projects complementing the work of the Provincial and Federal Geological Surveys.

Geochemical characterization of the felsic plutons in the Flin Flon region and the mafic/ultramafic sequences in the Thompson region expanded the sample collection program and provided new insights into the genesis of these formations. The initial results from the Thompson region are especially revealing in that volcanics from Ospwagan Lake appear to have an "ocean floor" chemistry not unlike that emerging from metavolcanic rocks of the Athapapuskow region.

Monazite, sphene and zircons were sampled to provide additional geochronological data for the Thompson region. Preliminary results range from around 3000 Ma for zircons in gneisses from Manasan and Sasagiu Rapids, to the youngest Hudsonian event variously dated around 1770 Ma by monazite, sphene, and by zircons in late pegmatite.

GEOLOGICAL SURVEY OF CANADA:

In the Thompson region two structural studies continued, one concentrating on the deformational history of the nickel orebodies and the other examining a transect across the Pikwitonei terrane to the Churchill Superior Boundary.

Geochronological studies continued with sampling in the Cross Lake region.

Regional water and lake sediment sampling survey was completed in 63H(NE), 63I, and 63P(SE).

PROJECT DESCRIPTIONS

MANITOBA GEOLOGICAL SERVICES BRANCH

PROJECTS 1.11.1 and 1.11.2: Cross Lake, geological mapping and regional evaluation

INVESTIGATORS: M.T. Corkery, H.D.M. Cameron, and P.G. Lenton

OBJECTIVES:

The objectives of this program are to stimulate and direct mineral exploration in the Cross Lake-Thompson region, and to provide a broader mineral base for the Thompson region by establishing an updated geological data base for supracrustal and ultramafic-anorthositic rocks which contain occurrences of strategic, base and precious metals.

PROGRESS:

Geological mapping in the Cross Lake area at a scale of 1:20 000 was carried out in the northeast corner of Central Cross Lake project area (NTS 63I-12 NW). This completes the mapping of the supracrustal rocks in the Cross Lake supracrustal investigations.

Mapping and sampling of the Ti-V bearing anorthosite-gabbro complex was completed.

Of five samples submitted to the Royal Ontario Museum in 1986 for U-Pb age determinations, two did not contain zircon and one contained zircon unsuitable for dating. Three ages were reported from two zircon phases and a titanite fraction from the other two samples.

Eight samples of a variety of units from the Cross Lake area were collected in the 1987 field season and submitted to the Royal Ontario Museum for U/Pb age determination.

The geochemical data base was increased by complete analysis of 51 rocks as well as 29 previously analyzed specimens. A further 10 samples were analyzed for rare earth elements.

PRODUCTS:

Preliminary maps 1987N-1 and 1987N-2 and a preliminary report GS-26 in the 1987 Report of Field Activities documented the findings in the northeast segment of the map area.

FOLLOW-UP AND IMPLICATIONS:

A further two week field commitment is planned to provide final correlation of outstanding problems in interpretation of the geology. A field information trip to provide guidance for a further geologic study (Ph.D.) dealing with structure, geothermometry and geobarometry in the area is also planned.

PROJECT 1.11.3: Thompson belt supracrustal rock investigations

INVESTIGATORS: J.J. Macek

OBJECTIVES:

To characterize lithologies of supracrustal rocks in areas of good exposure such as Thompson Pit, Pipe Pit, etc. in support of other investigations in the Thompson belt (Projects 1.16, 1.16.2, C.1.1.4., C.1.1.5, C.2.26) and for compilation purposes.

PROGRESS:

The lithologies of gneissic rocks of the Pipe Pit were documented in detail.

PRODUCTS

Report GS-27 in Report of Field Activities 1987.

FOLLOW-UP AND IMPLICATIONS:

Pipe Pit geological documentation will be continued. Ospwagan Lake supracrustals will be investigated.

In connection with results from other studies, the results of this work will advance our understanding of tectonic assemblage of Thompson belt, original deposition of supracrustals, and genesis of nickel deposits.

PROJECT 1.12: Field support for northern Superior U-Pb geochronology program

INVESTIGATORS: W. Weber in cooperation with T. Krogh, L. Heaman and N. Machado (Royal Ontario Museum), and the Geological Survey of Canada

OBJECTIVES:

To provide a geological framework, collect and provide rock samples for U-Pb isotope investigations, and to contribute to the geological evaluation of the U-Pb ages determined in the laboratories of the Royal Ontario Museum. Analyses are funded by the GSC.

PROGRESS

Eight samples from the Thompson belt and four samples from the Cross Lake area were collected and 23 additional zircon fractions were analyzed.

PRODUCTS:

Report in MSGB Report of Field Activities 1987.

Internal Progress Report by ROM - March 1988.

Two presentations at the GAC-MAC 1987 meeting.

Draft of paper to be published in a scientific journal.

FOLLOW-UP AND IMPLICATIONS:

Results date several thermal events in the Thompson belt and indicate that Thompson belt consists of more than one type of Archean crust. Results from Pikwitonei domain and Thompson belt will be included in a final report.

PROJECT 1.15: Project management

INVESTIGATOR: W. Weber

OBJECTIVES:

To supervise of field projects and conduct field demonstrations for potential MDA contributors.

Participate in MDA related field demonstrations.

PROGRESS:

A field trip was conducted in the Thompson area.

PRODUCTS:

Coordination of regional operations, syntheses of regional geology.

Two oral presentations at GAC-MAC 1987 meeting.

FOLLOW-UP AND IMPLICATIONS:

Field trip in the Thompson district in 1988.

Evaluation of airborne gradiometer surveys in the Bissett region to complement GSC and MGSB field projects.

PROJECT 1.16: Rubidium-strontium isotopic studies of selected rock units in northern Manitoba

INVESTIGATOR: G.S. Clark (University of Manitoba)

OBJECTIVES:

The objective of this project is to determine rubidium and strontium isotopic abundances for igneous and metamorphic rocks in the Cross Lake area and in the Superior-Churchill boundary area near Split Lake. The isotopic ages will be used to determine the age of intrusion of the Molson dykes in the northern Churchill Province and the age of formation of basement gneisses and younger granitic plutons in the Split Lake area. The results will permit a more orderly treatment of crust-forming events and crustal evolution. The

work will also be used to relate the timing of ore-forming events to crustal evolution and development.

PROGRESS:

Field work and sample collecting have been completed. The element and isotopic analyses of selected samples are almost complete. Most data processing has been completed and the results have been interpreted.

PRODUCTS:

A preliminary report was published in the 1987 Report of Field Activities.

The results have been submitted for the March 1988 Annual Report.

FOLLOW-UP AND IMPLICATIONS:

Some work related to this project will be expanded in order to determine more precisely the age and origin of the Fox Lake granite and basement gneiss at Split Lake.

PROJECT 1.16.2: Thompson belt geochemistry

INVESTIGATOR: N.M. Halden (U. of Manitoba)

OBJECTIVES:

To provide geochemical fingerprinting of mafic and ultramafic rocks in Thompson belt supracrustal belts.

PROGRESS:

XRF analyses of samples from Ospwagan-Assean, Moak Lake and Fox River were completed and partially processed (beads).

PRODUCTS:

Report in Report of Field Activities 1987.

FOLLOW-UP AND IMPLICATIONS:

Preliminary interpretation of the analyses indicates largely oceanic tectonic setting of analyzed samples. Further work regarding alteration is required.

PROJECT 2.20: Rare-element-enriched pegmatite evaluation

INVESTIGATORS: P. Cerny (Univ. of Manitoba), (G.H. Gale, MGSB)

OBJECTIVES:

This project is designed to investigate and document occurrences of rare-element-enriched pegmatites in north-central Manitoba and to establish techniques for exploration and evaluation.

PROGRESS:

This project is on schedule and proceeding as planned. Several pegmatite fields have been delineated and studied. Field work was started on the Magill Lake pegmatitic granite and associated pegmatites, and the sampling of the granite largely finished. Follow-up sampling at Red Sucker and Red Cross Lake will provide isotopic data and ages. Laboratory work was in progress on some aspects of the Cross Lake, Red Sucker Lake and Red Cross Lake fields, as well as the Magill Lake material.

PRODUCTS:

Annual report at fiscal year end received March 1988.

Preliminary reports in 1987 Reports of Field Activities.

Poster presentation on the Red Sucker Lake field at the 1987 GAC-MAC meeting in Saskatoon.

Assorted refereed publications in scientific media.

FOLLOW-UP AND IMPLICATIONS:

This contract will be renewed for 1988-89. Field work will concentrate on finishing the Magill Lake pegmatitic granite and associated pegmatite, with limited follow-up in those areas as may be required on the basis of laboratory data. Laboratory work will also concentrate on the Magill Lake intrusion and associated pegmatite, with limited follow-up on samples from other areas, as locally required by the basic data sets. Write-up of reports for publication will commence in 1988.

PROJECT 5.7: Thompson-Pikwitonei compilation

INVESTIGATORS: W. Weber, J.J. Macek, W.D. McRitchie and H.V. Zwanzig

OBJECTIVES:

To provide a comprehensive and up-to-date regional geological framework for identification of mineral exploration targets.

PROGRESS:

Compilation of geological data in NTS 63-O and 63N.

PRODUCTS:

Synoptic compilations of 63-O and 63N partly completed.

FOLLOW-UP AND IMPLICATIONS:

Work mentioned under Progress will continue for another year.

Detailed documentation of supracrustal rocks started at Thompson and Pipe Pits (Project 1.11.2) to be extended southwards in 1988.

1:250 000 synoptic geological compilation will require access to selected surface, drill hole and geophysical exploration information.

Information from Projects MGSB 1.16.1 and 1.16.2 to be compiled for inclusion into NTS 63-O and 63N.

GEOLOGICAL SURVEY OF CANADA:

PROJECT C.1.1.4: U/Pb Geochronology, N.W. Superior Province

INVESTIGATORS: T. Krogh (ROM),
T.M. Gordon (GSC/LCSD)

OBJECTIVES:

To select samples for U/Pb geochronological studies from the Pikwitonei granulite domain, Thompson belt and Cross Lake region, in support of concurrent work being carried out in these regions by the federal and provincial surveys. This work is carried out under contract from the federal government to the Royal Ontario Museum. The age dating will assist in further constraining the timing of deformation and metamorphism in the Thompson Mobile Belt, thereby defining the structural evolution of the Superior plate margin.

PROGRESS:

Investigators have calculated an age of 1786 ± 2 Ma for an undeformed granitic dyke from the Paint Lake region. As the 1884 ± 2 Ma Molson dykes are deformed in the TMB, the main Hudsonian event must have occurred between these two dates.

The Wintering Lake granodiorite yielded a complex zircon population indicating that the emplacement of the granodiorite was probably contemporaneous with the onset of the metamorphism in the central part of the TMB. Studies are in progress that will better constrain the history of the belt.

PRODUCTS:

Machado, N., Heaman, L., Krogh, T.E. and Weber, W., 1987: GSC-31: U-Pb geochronology program: Thompson Belt-Northern Superior Province; in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 145-147.

Machado, N. Heaman, L. and Krogh, T.E., 1987: U-Pb Geochronology of the Thompson Mobile Belt, Manitoba: Preliminary results; in Program with Abstracts, v. 13, GAC/MAC Joint Annual Meeting, p. 69.

FOLLOW-UP AND IMPLICATIONS:

Sample collection and processing will be completed; it is hoped some detailed sampling of the Thompson Pit in support of W. Bleeker's study (C.2.2.6) will be included. Results will be published in outside journals.

PROJECT C.1.1.5: Structural studies in the Thompson Belt

INVESTIGATORS: F. Fueten (U. of Toronto)

OBJECTIVES:

To determine direction and timing of various structural blocks bordering the Nelson Front, by studying major shear zones within the Thompson belt.

PROGRESS:

Frank Fueten completed field work in the Paint Lake-Wintering Lake area. A doctoral thesis dealing with the deformation in the granitoid gneisses is being completed under R. Robin at the University of Toronto. E. Froese is the GSC project supervisor.

PRODUCTS:

Feuten presented a poster on his work at the Manitoba Meeting with Industry, 1987.

FOLLOW-UP AND IMPLICATIONS:

Fueten's doctoral thesis will be completed in 1988-89. This study will supply additional data for the history of movement along the Nelson Front, and deformation in the Thompson Region.

PROJECT C.2.2.6: Thompson Nickel Belt

INVESTIGATORS: W. Bleeker (U.N.B.),
C. van Staal (GSC/LSCD), O.R. Eckstrand (GSC/MRD)

OBJECTIVES:

To study the structure and related geology of the nickel deposits at the Thompson Mine with the objective of determining their structural and metamorphic history and, if possible, defining new exploration targets. This will involve mapping of the new open pit, and underground workings, and logging of drill core.

PROGRESS:

Woulter Bleeker continued his doctoral study at the University of New Brunswick on the deformational history of the Thompson nickel orebodies. Petrological studies, microprobe analyses and pressure-temperature fugacity calculations were carried out during April and May.

The field season was spent completing the work in the Thompson Pit. Several pegmatites and sphene-bearing boudin-neck infillings, all of which date or bracket the various structural events, were sampled for geochronology. Suspected Molson Dyke candidates in the Thompson Nickel Belt were sampled for geochemical comparison with prototypes in the Superior Province.

PRODUCTS:

Bleeker, W., 1987: GSC-14: Thompson Nickel Belt (Project C.2.2.6); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p.171.

Bleeker, W., 1988: Structural investigations in the Thompson Nickel Belt, Manitoba; in Current Activities Forum 1988, Program with Abstracts, Geological Survey of Canada, p.3.

Bleeker, W., 1987: Structural-metamorphic history of the Thompson Mine; implications for the geology of the Churchill-Superior boundary along the Thompson nickel belt, Manitoba; in Program with Abstracts, GAC/MAC Meeting, Saskatoon, vol. 12, p.25.

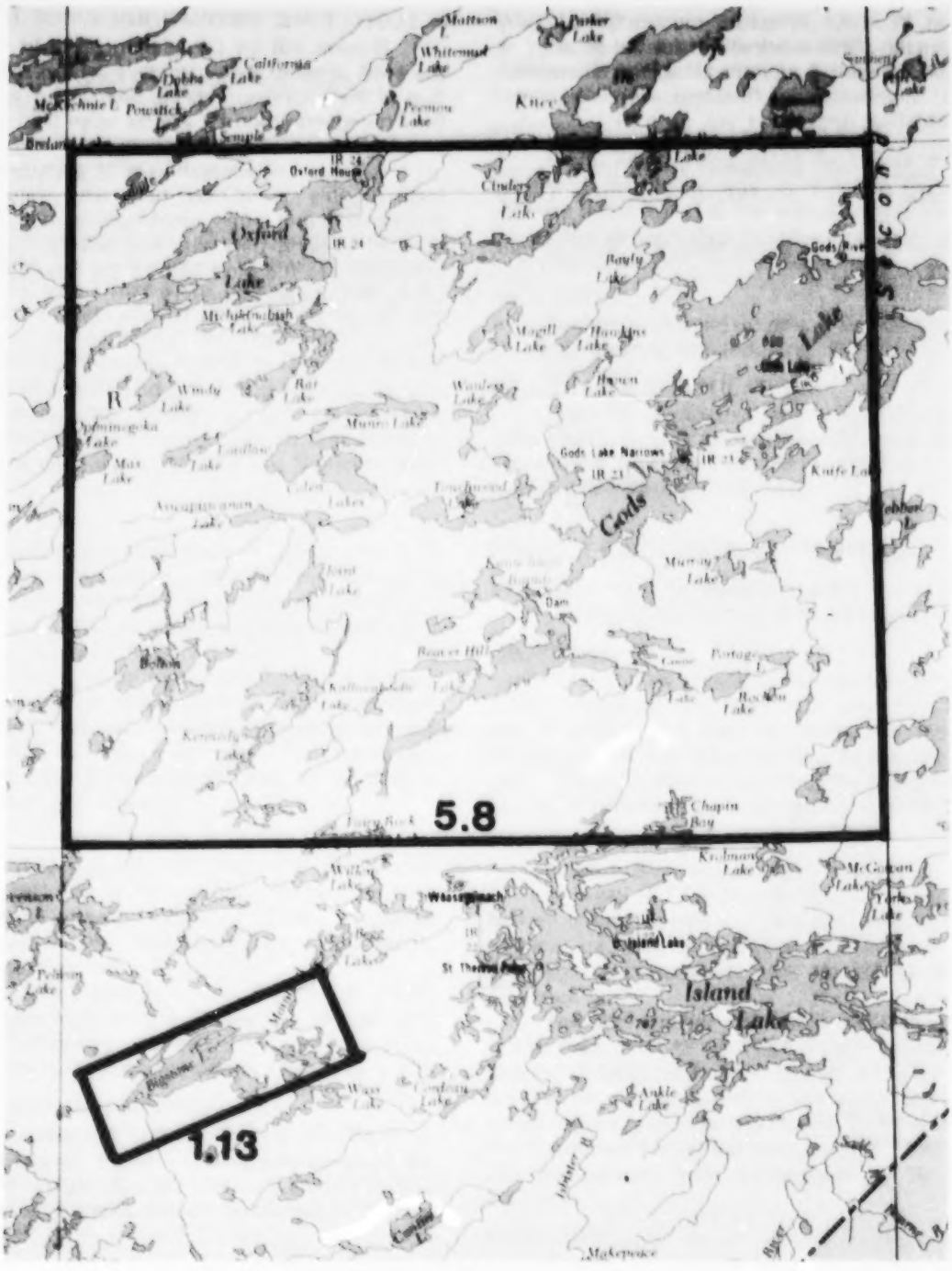
Bleeker, W., (in press): Structural model of the Thompson Nickel Belt, Manitoba; in GAC/MAC symposium volume on the Trans-Hudson Orogen, J. Lewry (ed.).

Poster presentation at the Manitoba Meeting with Industry, 1987.

FOLLOW-UP AND IMPLICATIONS:

Bleeker will be completing his field work during the 1988 season, with emphasis on the regional structure of the Thompson Nickel Belt. The detailed map of the Thompson Open Pit will be open filed with accompanying notes.

A better understanding of the deformational history of this metal-rich belt will assist both explorationists and mining geologists in evaluating potential and existing deposits, and will provide additional constraints to the modelling of the development of the Churchill-Superior boundary.



DISTRICT V : NORTHERN SUPERIOR

1.14, 1.13 Island Lake geological mapping
2.20 Rare-element enriched pegmatite evaluation
5.8 1:250 000 synoptic geological compilation, Gods Lake

Figure 11: Provincial Sector A projects (1987) - District V: Northern Superior.

DISTRICT V: NORTHWEST SUPERIOR PROVINCE, GODS - ISLAND LAKES REGION

SUMMARY:

MANITOBA GEOLOGICAL SERVICES BRANCH:

MDA activities in this region have grown in importance as industry has expanded its exploration programs to test the perceived high residual gold potential of the Gods, Island, and Oxford lakes region. Both Island Lake and Gods Lake have historically been gold producers, and new finds of gold mineralization could result in the development of self-contained mining, milling and smelting operations in these relative remote and inaccessible sectors of the Province.

Only two Provincial field projects continued in this region during 1987, although a 1:250 000 synoptic compilation for NTS 53L has been completed, and compilation and report production for adjacent sheets continues in Winnipeg.

Uranium lead zircon ages from the greenstones at Bigstone Lake and Knight Lake are comparable to those at Island Lake indicating a minimum age of 2890 Ma for the mafic volcanics in these regions.

Samples were collected from the Magill Lake granite and associated pegmatites at Magill and Knee lakes, and near Hawkins and McLaughlin lakes. With the exception of a single columbite-tantalite dyke crosscutting the Oxford Lake Group, rare-element minerals are typically absent within the pegmatite pods and dykes on Magill Lake. Spodumene was confirmed at McLaughlin Lake.

An MDA-sponsored thesis on the rare-element pegmatites from Red Sucker Lake was completed during the summer.

GEOLOGICAL SURVEY OF CANADA:

Studies were continued on the Fox River mafic-ultramafic sill with further definition of the internal stratigraphy and its relationship to PGE concentrations.

PROJECT DESCRIPTIONS

MANITOBA GEOLOGICAL SERVICES BRANCH:

PROJECT 1.13: Bigstone Lake-Ponask Lake mapping

INVESTIGATORS: W. Weber and K.L. Neale

OBJECTIVE:

The objective is to provide an updated geological data base interpreted on the basis of modern concepts of base and precious metal deposits in order to assist mineral exploration which is presently active in this area.

PROGRESS:

Initiation of U-Pb zircon geochronology at Bigstone-Knight Lake area.

PRODUCTS:

Report in Report of Field Activities (1987) with two U-Pb zircon ages.

FOLLOW-UP AND IMPLICATIONS:

U-Pb ages confirm data from Island Lake that volcanic and plutonic rocks are greater than 2.86 Ga. Island Lake Group equivalents have not been established (yet) in Bigstone-Knight Lake area.

GEOLOGICAL SURVEY OF CANADA:

PROJECT C.2.2.4: Fox River Sill

INVESTIGATORS: R.F.J. Scoates (GSC/MRD),
O.R. Eckstrand (GSC/MRD),
P.L. Schwann (Carleton U.)

OBJECTIVES:

The project is designed to contribute to the understanding of magmatic processes that give rise to concentrations of platinum-group-bearing sulphides in certain stratigraphic horizons of the Fox River Sill. Cryptic variations of silicate mineral compositions, distribution and interelement association of PGE's and detailed igneous stratigraphic studies will contribute to assessing the potential of this intrusion to host economic concentrations of PGE's.

PROGRESS:

A Master's thesis by P.L. Schwann (supervised by D.H. Watkinson), on the relationship of PGE mineralization to the sill stratigraphy is in the final stages of completion.

Correlation of exploration drill hole data in the western part of the Fox River Sill indicates that the lower 600 m of Upper Central Layered Zone (UCLZ) stratigraphy (approximately the lower half of UCLZ) comprises a minimum of 24 cyclic units.

In addition, the lowermost 80 m of UCLZ comprises a number of small-scale cyclic units, each of which consists of a lower olivine + chromite clinopyroxene cumulate layer overlain by a clinopyroxene + olivine cumulate layer. Anomalous platinum-group element concentrations occur sporadically throughout the stratigraphic succession. These anomalous concentrations are hosted by sulphide-bearing olivine clinopyroxenites.

PRODUCTS:

Scoates, R.F.J., 1987: GSC-12: Fox River Sill (Project C.2.2.4); in Report of Field Activities 1987, Manitoba Energy and Mines, Minerals Division, p. 170.

Scoates, R.F.J. and Schwann, P.L., 1988: Platinum-Group Element mineralization in the Upper Central Layered Zone of the Fox River Sill, Northeastern Manitoba; in Current Activities Forum 1988, Program with Abstracts, Geological Survey of Canada, p. 24.

Scoates, R.F.J., Schwann, P.L. and Eckstrand, O.R., 1988: Geochemical patterns associated with PGE mineralized units of the Fox River Sill, northeastern Manitoba, Canada; Abstract, K.M. Goldschmidt Conference, Maryland, U.S.A.

Schwann, P.L. and Scoates, R.F.J., 1988: Petrology of platinum-group element mineralized units, Upper Central Layered Zone, Fox River Sill, northeastern Manitoba; Abstract, GAC/MAC 1988, St. John's, Nfld.

Hulbert, L., Duke, J.M., Eckstrand, O.R., Lydon, J., Scoates, R.F.J., 1988: The Fox River Sill, Manitoba; in Geological environments of the Platinum Group Elements: Notes for a workshop presented by the Geological Survey of Canada and sponsored by the Cordilleran Section, GAC, p.38-44.

Poster presentation at the Manitoba Meeting with Industry, 1987.

PROJECT C.5.1.1: Surficial Geology Atlas Compilation, Manitoba - North of 52°

INVESTIGATORS: M. Clarke (GSC/TS), R.N.W. DiLabio (GSC/TS)

OBJECTIVES:

To produce an atlas showing: 1) surficial geology, 2) till geochemistry, and 3) granular material resources. Coverage to start in northeast corner of area and proceed clockwise using data from Dredge, Kaszycki, Klassen, DiLabio (GSC) and Nielsen (MGSB). Gaps' in coverage to be filled in by airphoto interpretation and a limited amount of field checking. Legends, other specs, style of presentation to be determined by same personnel.

PROGRESS:

Regional mapping of surficial geology continues in areas of Manitoba previously unmapped at scales of 1:250K or larger. 1987 field investigations were conducted in western Manitoba in the areas between Flin Flon and Swan River. In an effort to ground truth surficial geology units interpreted from aerial photographs, over 150 sites were visited in NTS map areas 63C, F and K. Particular attention has been paid to surface distribution of till and glaciolacustrine sediments in the region.

Investigations into the usefulness of satellite imagery for mapping surficial geology in the boreal forest of Manitoba have assisted in the interpretation of air photos and have also provided an alternative method of regional mapping.

PRODUCTS:

Clarke, M.D., 1988: Surficial geology of Stull Lake, Manitoba; Geological Survey of Canada, Map 1672A.

Clarke, M.D., 1988: Surficial geology of Oxford House, Manitoba; Geological Survey of Canada, Map 1673A.

Clarke, M.D., 1988: Surficial Geology of Norway House, Manitoba; Geological Survey of Canada, Map 1671A.

Clarke, M.D., 1987: Surficial geology mapping using LANDSAT and Space Shuttle Acquired Imagery, Oxford House, Manitoba; poster. INQUA Congress, Program with Abstracts, p. 144.

FOLLOW-UP AND IMPLICATIONS:

Field checking will be completed for area NTS 53O, 54A, B, G, and drafting and publication will be completed for surficial geology maps of areas NTS 53O, 54A, B, G and 63C, F, K. Further studies will be carried out into the application of satellite imagery to surficial geology.

PROJECT DESCRIPTIONS

MANITOBA GEOLOGICAL SERVICES BRANCH:

PROJECT 2.21: Lead-zinc potential of carbonate rocks in southern Manitoba

INVESTIGATOR: G.H. Gale

OBJECTIVES:

To identify the source of galena float discovered in Manitoba and to determine the potential for occurrence of lead and zinc in carbonate rocks of Manitoba.

PROGRESS:

Phase I of the project is completed. Drill cores have been cut and crushed. The data are filed for computer manipulation. Heavy mineral separates have been completed for all profiles.

PRODUCTS:

None in 1987-88.

FOLLOW-UP AND IMPLICATIONS:

The data will be processed and an open file report will be prepared. The results will dictate the extent and type of work to be undertaken as Phase II of this project.

PROJECT 2.26: Industrial minerals mapping, Duck Mountain

INVESTIGATOR: B.E. Schmidtke

OBJECTIVES:

The purpose of this program is to document the nature, extent and reserves of all industrial minerals occurrences in the Duck Mountain map area NTS 62N. Occurrences of dolomite, glauconite, silica sand, lignite and bentonite will be examined and sampled, and the geological setting of the occurrences described in detail.

PROGRESS:

Known industrial minerals occurrences in the north half of the NTS 62N map sheet were examined and sampled. Several peat bogs with a potential for fuel or horticultural peat were sampled.

PRODUCTS:

Preliminary report (GS-41) in Report of Field Activities 1986 describes the findings in NTS 62N map sheet area.

FOLLOW-UP AND IMPLICATIONS:

Completion of this project has been delayed to concentrate on the dimension stone resource assessment.

PROJECT 4.1.2: Lead-zinc potential of carbonate rocks in southern Manitoba

INVESTIGATOR: E. Nielsen

OBJECTIVES:

To identify the source of galena float discovered in Manitoba and to determine the potential for occurrence of lead and zinc in carbonate rocks of Manitoba using geochemistry of the less than two micron fraction of overburden samples.

PROGRESS:

The geochemistry of the less than two micron fraction of 573 overburden samples collected from 372 backhoe pits in southern Manitoba is complete. Pebble counts and grain size analysis on selected samples is nearing completion.

Geochemical analyses have not identified any anomalous base metal occurrences in the area. The geochemistry of the tills shows a close correspondence with the bedrock in all area.

PRODUCTS:

Geological Paper GP87-1, detailing the results of the geochemistry and the preliminary Quaternary stratigraphy of the area, should be available for release late in 1988.

FOLLOW-UP AND IMPLICATIONS:

The study has produced a stratigraphy of Quaternary sediments for the Manitoba Interlake and West Lake areas using field relations and geochemistry of the sediments. The association of galena float with Komarno till in the Balmoral area suggests it may have been derived from the Devonian outcrop belt.

No further follow-up is planned at this time.

PROJECT 5.12: Mineral deposit compilations

INVESTIGATOR: G.H. Gale

OBJECTIVES:

To provide an organized data base for mineral deposit information on 1:50 000 scale base maps.

PROGRESS:

One assistant working with the project leader has established a standard format for this map series and report. A 1:20 000 map and report for 63K/13 SE has been completed as Mineral Deposit Series, Report No. 1. Two maps and reports are in a second draft stage.

PRODUCTS:

Mineral Deposits and Occurrences in the Flin Flon area NTS 63K/13: Part I, Mikanagan Lake area (63K/13SE).

FOLLOW-UP AND IMPLICATIONS:

Two 1:50 000 NTS sheets will be completed for the Flin Flon area in the next 12 months. Text for the accompanying reports is being assembled and edited.

EXPLORATION SERVICES (MINES BRANCH):

The Exploration Services Section continues to mount and support MDA initiatives in the areas of drill core retrieval, liaison with industry, and by generating compilations of various types. The Department's publications distribution function has been transferred to the Information Office, Room 555 on the fifth floor of Eaton Place.

The principal objective set for the core retrieval program during 1987 was to establish a computer-based master inventory of the northern Manitoba drill library holdings. By September approximately 70% of the inventories from The Pas, Thompson and Lynn Lake had been entered onto computer files.

Other projects conducted during the year included updating of inventories, field collection, reboxing and culling of core, and improvements to building site drainage.

One of the major new thrusts of the Section was the re-establishment in September of the Regional Geologist in The Pas, a position that fell dormant in 1977. David Prouse is welcomed to the position which will provide an elevated level of liaison and services to the mineral industry in northern Manitoba.

Exploration Services also continued to monitor and report on company activities in the Province as well as distributing large numbers of brochures and publications. Significant additions were made to the content and retrievability of the Bibliography of Manitoba Geology, as well as completing the updating of the mineral inventory for gold deposits/occurrences. Phase 2 of the Bibliography was printed as Open File Report OF88-1.

An Economic Geology report "Gold Deposits in Manitoba" (produced jointly with the Geological Services Branch) was released in November 1987.

Assessment files were completely re-organized and new index maps completed for airborne geophysical surveys. Displays and brochures were prepared for several major public events, including the annual Prospectors & Developers Convention, the Careers Symposium, and articles for various journals.

PROJECT 5.9: Bibliographies Progress Report

INVESTIGATOR: D. Fogwill March 1988

"Bibliography of Manitoba Geology 2" (Open File Report OF88-1) has been printed and will be released on April 20, 1988. This report supplements "B.M.G.1" (OF86-1) and contains references to provincial and federal publications, journal literature, theses and conference abstracts, sorted by author and year. The bibliography database now contains 6400 references; 3000 of which have subject keywords obtained from the American Geological Institute's "GeoRef" database. Users can search the Manitoba database for any combination of authors, years, and words or phrases occurring in the title of the references (or GeoRef's keywords). Plans are underway to extend computer searching to PC users via the DATAPAC network. Searches by NTS areas for all references will be available by March 31, 1989. "Gold Deposits of Manitoba" (Economic Geology Report ER86-1) was released on November 24, 1987 and all 270 copies sold out in two months. Reprinting of this publication will be done early in the next fiscal year. Mineral inventory cards for platinum and chromite have been compiled and updated to March 31, 1988 and cards for pegmatite are presently being revised. Index maps, showing the outline of work described in geological reports and maps, were updated to December 1987. Displays and brochures were prepared for the March 1988 Prospectors and Developers in Toronto; and Brandon and Winnipeg Careers Symposium held in February and March, respectively. The third annual meeting of the Mineral Exploration Liaison Committee was attended by two Section staff in November, 1987 and the Head of the Section served as Manitoba's Co-Secretary to the Mineral Development Agreement Management Committee during the year.

IV. OUTPUTS - PUBLICATIONS, PRESENTATIONS, DISPLAYS, BROCHURES

MDA PUBLICATIONS AND TECHNICAL INFORMATION RELEASES:

MANITOBA*:

i REPORTS:
- Departmental publications;
- Report of Field Activities;
- Preliminary Maps

ii UNPUBLISHED REPORTS:
- (on file in Manitoba Energy and Mines, Geological Services Branch)

iii EXTERNAL PUBLICATIONS

iv MINERAL DEPOSIT FILES

v DATA FILES

vi PRESENTATIONS:
- Manitoba Energy and Mines Annual Meeting
- Other

vii FIELD DEMONSTRATIONS

CANADA: (Refer to individual Project Descriptions for listing of OUTPUTS).

*Includes output of programming initiated/conducted during the Interim Mineral Agreement (1983)

I. REPORTS

Departmental Publications:

Bailes, A.H.and Syme, E.C.
1987: Geology of the Flin Flon-White Lake area; Geological Map GR87-1-1

Bannatyne, B.B.
1988: Dolomite resources of Southern Manitoba; Economic Geology Report ER85-1 (in prep.)

Cameron, H.D.M.
1988: Geology of the Eden Lake area; Geological Report GR 84-2 (in press)

Canada-Manitoba Mineral Development Agreement 1984-89 (ERDA)
1986: Sector A Geoscientific Activities, Progress Report 1986-87; Open File Report OF87-3.

Corkery, M.T.(Map Committee Chairman)
1987: Geological Highway Map of Manitoba; MDA Special Publication No. 1; scale 1:1 000 000.

Fedikow, M.A.F. and Ferreira, K.J.
1987: Results of the rock geochemistry survey of the Lynn Lake Rhyolitic Complex, Open File Report OF87-6.

Ferreira, K.J. and Fedikow, M.A.F.
1988: Preliminary results of a humus geochemical survey over the Rod Cu-Zn deposits, Snow Lake, Manitoba; Manitoba Mineral Resources Division, Open File Report OF87-12.

Fedikow, M.A.F.
1988: The application of MEIS II and MSS remote sensing imagery to the Agassiz Metallotect, Lynn Lake; Remote Sensing in Manitoba - Newsletter, January.

Fedikow, M.A.F.
1988: Gold in Manitoba, Mineral Education Series, Manitoba Energy and Mines (in press).

Gale, G.H. and Eccles, D.R.
1987: Mineral Deposits and Occurrences in the Mikanagan Lake Area, (63K/13 SE); Manitoba Energy and Mines, Geological Services, Mineral Deposit Series, Report No. 1

Manitoba Energy and Mines:
Earth Science Film Program for Manitoba schools; MDA project.

Manitoba Energy and Mines
1986: Granville Lake - NTS 64C, 1:250 000, with marginal notes; Bedrock Geology Compilation Map 64C.

Manitoba Energy and Mines
1987: Kenora - NTS 52E, 1:250 000 with marginal notes; Preliminary Bedrock Geology Compilation Map 52E.

Manitoba Energy and Mines
1987: Pointe du Bois - NTS 52L, 1:250 000 with marginal notes; Preliminary Bedrock Geology Compilation Map 52L.

Manitoba Energy and Mines
1988: Oxford House - NTS 53L, 1:250 000 with marginal notes; Bedrock Geology Compilation Map 53L.

Manitoba Energy and Mines
1988: Herchmer - NTS 54E,1:250 000 with marginal notes; Bedrock Geology Compilation Map 54E (in preparation).

Manitoba Energy and Mines
1988: Northern Indian - NTS 64H, 1:250 000 with marginal notes; Bedrock Geology Compilation Map 64H (in preparation).

Nielsen, E.
1987: Till geochemistry of the Seal River area, east of Great Island, Manitoba; Open File Report OF87-1.

Nielsen, E. and Fedikow, M.A.F.
1987: Glacial dispersal of trace elements in Wisconsinan till in the Dot Lake-MacLellan Mine area, Manitoba; Open File Report OF87-2.

Richardson, D.J. and Ostry, G.
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Introductory review; by W.D. McRitchie

LYNN LAKE DISTRICT
GS-1 Gold mineralization associated with the Johnson Shear Zone; by D.A. Baldwin
GS-2 Investigation of Agassiz Metallotect stratigraphy; by D. Parbery and M.A.F. Fedikow
GS-3 Geological Investigations at Burge Lake, Lynn Lake greenstone belt; by K. Ferreira
GS-4 Vegetation geochemical surveys, Lynn Lake and Bissett areas; by M.A.F. Fedikow
GS-5 Mineral deposit investigations in the Ruttan Lake area; by D.A. Baldwin
GS-6 Till geochemistry in selected areas of northern Manitoba; by E. Nielsen

FLIN FLON DISTRICT
GS-7 Athapapuskow Lake Project; by E.C. Syme
GS-8 Geological investigations in Tartan Lake-Lac Aimée area; by H.P. Gilbert
GS-9 Kisseynew Project: Kississing Lake; by D.C.P. Schledewitz
GS-10 Kisseynew Project: Limestone Point Lake-Star Lake area; by H.V. Zwanzig and P.G. Lenton
GS-11 Burntwood Lake syenite; by W.D. McRitchie
GS-12 Chisel-Morgan lakes Project; by A.H. Bailes
GS-13 Project Cormorant: Sub-Paleozoic investigations south of Flin Flon and Swan Lake; by W. Weber and I Hosain
GS-14 Geology of the Leo Lake area; by K. Ferreira
GS-15 Mineral investigations in the Kisseynew gneiss terrain; by G.M. Ostry
GS-16 Mineral occurrence documentation and geochemical surveys in the Snow Lake area; by M.A.F. Fedikow and C. Malis
GS-17 Industrial Mineral occurrences in the Flin Flon, Snow Lake and Thompson areas; by W.R. Gunter and P. Yamada
GS-18 Geochemistry of granites in the Snow Lake-Flin Flon area; by N.M. Halden
GS-19 U-Pb zircon geochronology in the Flin Flon belt: Age of Amisk volcanism; by E.C. Syme, A.H. Bailes, T.M. Gordon and P.A. Hunt

SOUTHEAST MANITOBA
GS-20 Geological investigations in the Lily Lake area; by W. Weber
GS-21 Investigations of Quaternary placer gold occurrences in the Manigotagan area; by E. Nielsen and R.N.W. DiLabio
GS-22 Mineral deposit investigations in the Rice Lake greenstone belt; by P. Theyer
GS-23 Platinum group elements in southeastern Manitoba; by P. Theyer
GS-24 U-Pb zircon geochronology of the Rice Lake area; by A. Turek, R. Keller, W. Weber and W.R. Van Schmus
GS-25 Dimension stone potential of southeastern Manitoba; by B.E. Schmidtke and D.I.D. Gaye

THOMPSON-CROSS LAKE DISTRICT
GS-26 Cross Lake supracrustal investigations; by M.T. Corkery and H.D.M. Cameron
GS-27 Geological mapping at Pipe Mine; by J.J. Macek
GS-28 Geochemistry of mafic volcanism at the Churchill-Superior boundary zone; by N.M. Halden
GS-29 Rb-Sr geochronology of the Churchill-Superior boundary zone and Cross Lake area; by G.S. Clark

NORTHERN SUPERIOR DISTRICT
GS-30 Granite and pegmatites at Magill Lake, Manitoba; by R.E. Meintzer, P. Cerny and P. Penner
GS-31 U-Pb geochronology program: Thompson belt-Northern Superior Province; by N. Machado, L. Heaman, T.E. Krogh and W. Weber
GS-32 U-Pb zircon geochronology of Bigstone Lake-Knight Lake area; by A. Turek and W. Weber

MANITOBA GENERAL
GS-33 Stratigraphic mapping and stratigraphic and industrial minerals core hole program; by H.R. McCabe
GS-34 Preliminary observations from a detailed geological investigation of the MacLellan Au-Ag deposit, Lynn Lake; by J. Gagnon

PRELIMINARY MAPS 1987 (released November 20, 1987)

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1987F-2 Athapapuskow Lake (Part of 63K/12E); by E.C. Syme 1:15 840
1987F-3 Tartan Lake-Lac Aimée (Part of 63K/13); by H.P. Gilbert 1:15 840
1987K-1 Kississing Lake West (63N/3); by D.C.P. Schledewitz 1:20 000
1987K-3 Limestone Point Lake (Parts of 63N/1,2); by H.V. Zwanzig, P.G. Lenton and B.S. Miller 1:50 000

1987K-5 Burntwood Lake Syenite (63N/8,9,10); by W.D. McRitchie 1:4200

1987N-1 Cross Lake Southwest (63-1/12 NW); by M.T. Corkery and H.D.M. Cameron 1:20 000

1987S-1 Chisel-Morgan Lakes (Part of 63K/16); by A.H. Bailes 1:15 840

1987T-1 Thompson Open Pit Mine-1C Pit Cross-section (Part of 63P/12W); by J.J. Macek 1:500

2) Mineral Investigations:

1987MI-1 Leo Lake (Part of 63K/13); by K. Ferreira 1:5000

Mineral Deposit Map Series, Preliminary Edition Mineral Deposits and Occurrences in the Mikanagan Lake Area (63K/13SE); by D.R. Eccles 1:20 000

ii UNPUBLISHED REPORTS

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iii EXTERNAL PUBLICATIONS

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*Papers have been submitted, or are in the process of being submitted, on these subjects and will be included in a Symposium Volume to be published on the Trans-Hudson Orogen.

iv MINERAL DEPOSIT FILES

(Background data to Mineral Deposit Compilation series)

5 Files on gold occurrences in the Bissett area.
25 Files on mineral occurrences in the Snow Lake area.
10 Files on industrial mineral occurrences in Southeast Manitoba, and Flin Flon-Snow Lake area.

v DATA FILES

70 Chemical analyses of rocks from the Athapapuskow Lake area (whole rock and trace; several with rare element data).

110 Chemical analyses of rocks from the Chisel-Morgan Lakes area (whole rock and trace; several with rare element data).

22 Chemical analyses of rocks from the Burntwood Lake aegirine-augite syenite (major elements plus Y, Zr, Nb, Rb, Sr and Ba).

vi PRESENTATIONS

Manitoba Energy and Mines Annual Meeting with Industry, November 20, 1987:

Review of Activities; W.D. McRitchie

Highlights of Provincial Mineral Investigations Program; G.H. Gale

Highlights of Provincial Geological Mapping Program; W. Weber

Applied Geoscience Research at the University of Manitoba; N. Halden

Mineralization in the Kisseynew domain - An update; G. Ostry and G.H. Gale

New interpretation of the "Sherridon Group", Kisseynew domain; H. Zwanzig

Platinum Environments in Manitoba; P. Theyer

Other Presentations:

Silicification, Fe-Mg metasomatism and synvolcanic plutonism, Snow Lake, Manitoba; by A.H. Bailes, at CIM Snow Lake and Flin Flon (April, 1987) and at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Till provenance as it relates to the glacial history of The Pas-Flin Flon area, Manitoba; by H. Groom and E. Nielsen at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Geology of the Thompson open pit; by J.J. Macek, at CIM Thompson (March, 1987)

Five years of till geochemistry in Manitoba - A Review; by E. Nielsen, at WIUGC Winnipeg (January, 1988)

Stratigraphy and geochemistry of two Proterozoic arcs: Lynn Lake and Flin Flon metavolcanic belts, Manitoba; by E.C. Syme, at GAC-MAC Annual Meeting, Saskatoon (May, 1987) and at Geological Society of Saskatchewan, Regina (January, 1988)

The Churchill-Superior boundary zone: Constraints for the tectonic evolution of the southeastern margin of the Trans-Hudson Orogen; by W. Weber, at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Project Cormorant: An attempt to delineate Precambrian basement geology beneath Paleozoic carbonates south of Flin Flon-Snow Lake; by W. Weber and T.M. Gordon, at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Stratigraphy and tectonics of the Kisseynew Complex, Manitoba; by H.V. Zwanzig, at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Exploration for PGE in Manitoba; by P. Theyer, at CIM [Local], Lynn Lake (September, 1987)

Uranium and base metal potential in the Paleozoic rock of southern Manitoba; by G.H. Gale, H.R. McCabe and E. Nielsen, at GAC-MAC Annual Meeting, Saskatoon (May, 1987).

An overview of the geological setting of gold mineralization in the Churchill Province of Manitoba; by G.M. Ostry, at CIM [Local], Thompson (April, 1987).

An overview of the geological setting of gold mineralization in the Churchill Province of Manitoba; by G.H. Gale, M.A.F. Fedikow and G. Ostry, at GAC-MAC Annual Meeting, Saskatoon (May, 1987)

Vegetation geochemistry and gold exploration in Manitoba; by M.A.F. Fedikow, at Prospectors and Developers Association Annual Meeting, Toronto (March, 1988; at CIM [Local], Lynn Lake (January, 1988); at CIM [Local], Thompson (February, 1988).

vii FIELD DEMONSTRATIONS

Bailes, A.H. and Syme, E.C.: Field demonstrations of Flin Flon and Snow Lake geology in conjunction with the GAC-MAC Annual Meeting, Saskatoon, 35 participants, May, 1987 (5 days).

Corkery, M.T. and Cameron, H.D.M.: Field trip demonstrations in Cross Lake for federal government geologists and staff of Royal Ontario Museum (2 days in June).

Gale, G.H. and Ostry, G.M.: Field demonstration of Kisseynew terrain geology for two mining industry groups (June and July).

Nielsen, E.: Field demonstrations of Quaternary geology of Manitoba in conjunction with INQUA Meeting, Ottawa, August, 1987.

Macek, J.J., Weber, W. and Zwanzig, H.V.: Field trip demonstrations in Thompson (Thompson Pit), Sipiwesk Lake and Setting Lake for 20 members of FONB (Friends of the Nickel Belt) - geologists from governments, universities and mining industry interested in new developments of the geology of the Thompson belt (3 days in June).

V. 1988-89 WORKPLAN

The Sector A Workplan for 1988-89 was approved by MDA Management Committee at its 10th meeting on March 15 in Ottawa. Copies were distributed to members of the Mineral Exploration Liaison Committee on March 21 and a provisional listing of projects tabled at the Prospectors and Developers Association annual convention in Toronto (March 7-9).

An outline of the programming is to be presented at the April 21 meeting of the CIM in Winnipeg and subsequently in each of the mining districts prior to the field season.

In 1988/89 the Province will mount 35 projects including 17 geological mapping, 13 mineral investigations, 4 compilation and 1 basal till investigation. A modest level of field surveys will be maintained in all mining districts, although greater emphasis will be given to report and map production in this the final year of the agreement.

The majority of the 27 sub-projects and contracts carried out within the 20 federal geoscience projects have their field studies completed, and emphasis will also be directed toward documenting and publishing their findings. This will include the completion of seven Masters and three Doctoral theses in 1988-89, and two M.Sc. and one Ph.D. in 1989-90.

Provincial and Federal expenditure projections for 1988-89 are shown by district in Table 3.

DISTRICT SUMMARIES

LYNN LAKE-RUTTAN (DISTRICT 1)

GEOLOGICAL SERVICES BRANCH:

In the LYNN LAKE-RUTTAN district Dave Schledewitz will continue preparation of his final report on the geology of the Big Sand-Brochet area (1.1). Dorne Kowerchuk, Dave Schledewitz, Tim Corkery and Paul Lenton will complete synoptic geological compilation maps of NTS areas 54E, 64H, 64F, 64G (5.1). Herman Zwanzig will continue preparation of final reports and maps on sedimentary rocks and structure in the Lynn Lake greenstone belt (5.3). Dave McRitchie will continue investigations into alkali intrusions between Lynn Lake and Flin Flon-Snow Lake (1.17.1). Erik Nielsen will continue sampling and geochemical analyses of basal till in the Ruttan Lake region as a method of exploration for base metal and gold deposits (4.1). Dave Baldwin will be engaged in the preparation of Mineral Deposits maps and Mineral Deposit Index Maps (2.29) in addition to preparation of reports on gold mineralization associated with the Johnson Shear Zone (2.2), alteration at the Lar Cu, Zn deposit (2.6.3) and the geology of the Fox Mine area. Mark Fedikow will continue geochemical and stratigraphic studies of iron formation associated with the Agassiz Metallotect (2.4, 2.32, 2.7).

TABLE 3.

SECTOR A 1988-89 EXPENDITURE PROJECTIONS BY DISTRICT

	GSC ($000)	MGSB ($000)	%
LYNN LAKE-RUTTAN	282.4	123.1	21
FLIN FLON-SNOW LAKE	612.0*	302.5	48
SOUTHEAST MANITOBA	126.5	162.5	15
THOMPSON	52.0	45.0	5
GODS-ISLAND LAKES	57.1	63.0	6
MANITOBA GENERAL -	94.1		5
TOTAL	1131.0	790.3	100

*Includes $452K for gradiometer surveys and related costs.

FLIN FLON-SNOW LAKE (DISTRICT 2)

GEOLOGICAL SERVICES BRANCH:

Alan Bailes and Ric Syme will complete a final report on the geology of the Flin Flon-White Lake area (5.1). Ric Syme will continue 1:20 000 scale mapping of Athapapuskow Lake (1.5.3). Alan Bailes will continue and complete this phase of 1:20 000 scale mapping in the Chisel Lake-Morgan Lake area (1.5.4). Paul Gilbert will continue 1:20 000 scale mapping in the Tartan Lake-Mikanagan Lake area (1.5.5). Dave Schledewitz will complete 1:20 000 scale mapping in the Kississing Lake area (1.6.1), and Herman Zwanzig will continue and complete 1:20 000 scale mapping east of Kississing Lake (1.6.2). Scout drilling in the Cormorant Lake area under the drill supervision of D. Berk (1.7), will provide additional data of critical value to the compilation of the basement geology. Werner Weber in cooperation with the Geological Survey of Canada will continue preparation of a geological map of sub-Paleozoic Precambrian, NTS 63K and 63J-W/3, based on airborne gradiometer surveys and drill hole data (5.6). Dave McRitchie, Herman Zwanzig and Josef Macek will continue synoptic compilation for NTS 63N and 63-O for release as 1:250 000 preliminary maps of the compilation map series (5.7). Mark Fedikow will undertake stratigraphic and geochemical studies and mineral deposit documentation in the Wekusko Lake area (2.24, 2.7). Gary Ostry will continue documentation of the mineral occurrences in the File Lake and Sherridon areas (2.24, 2.10).

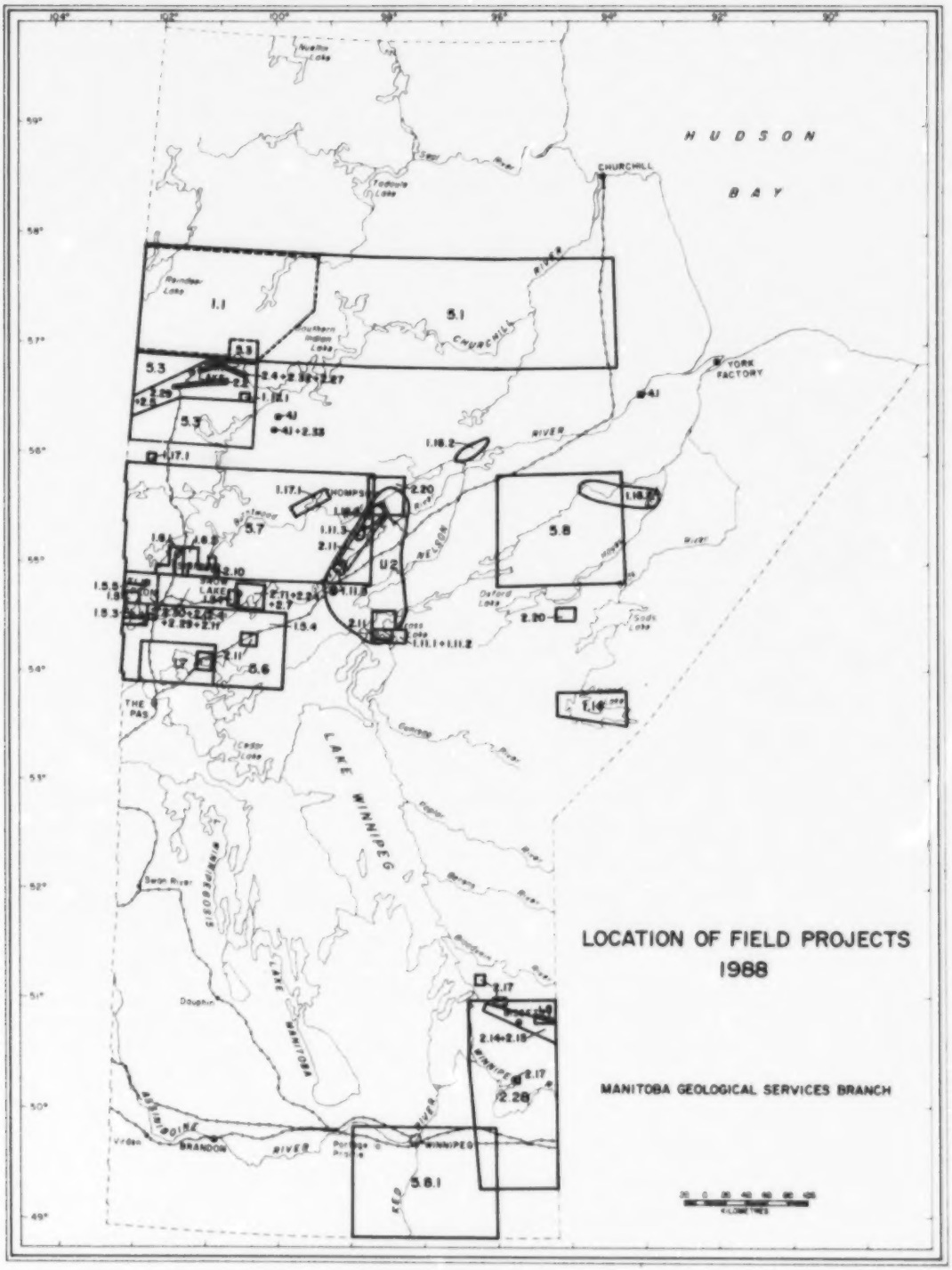


Figure 12: Location of Provincial Projects (1988/89).

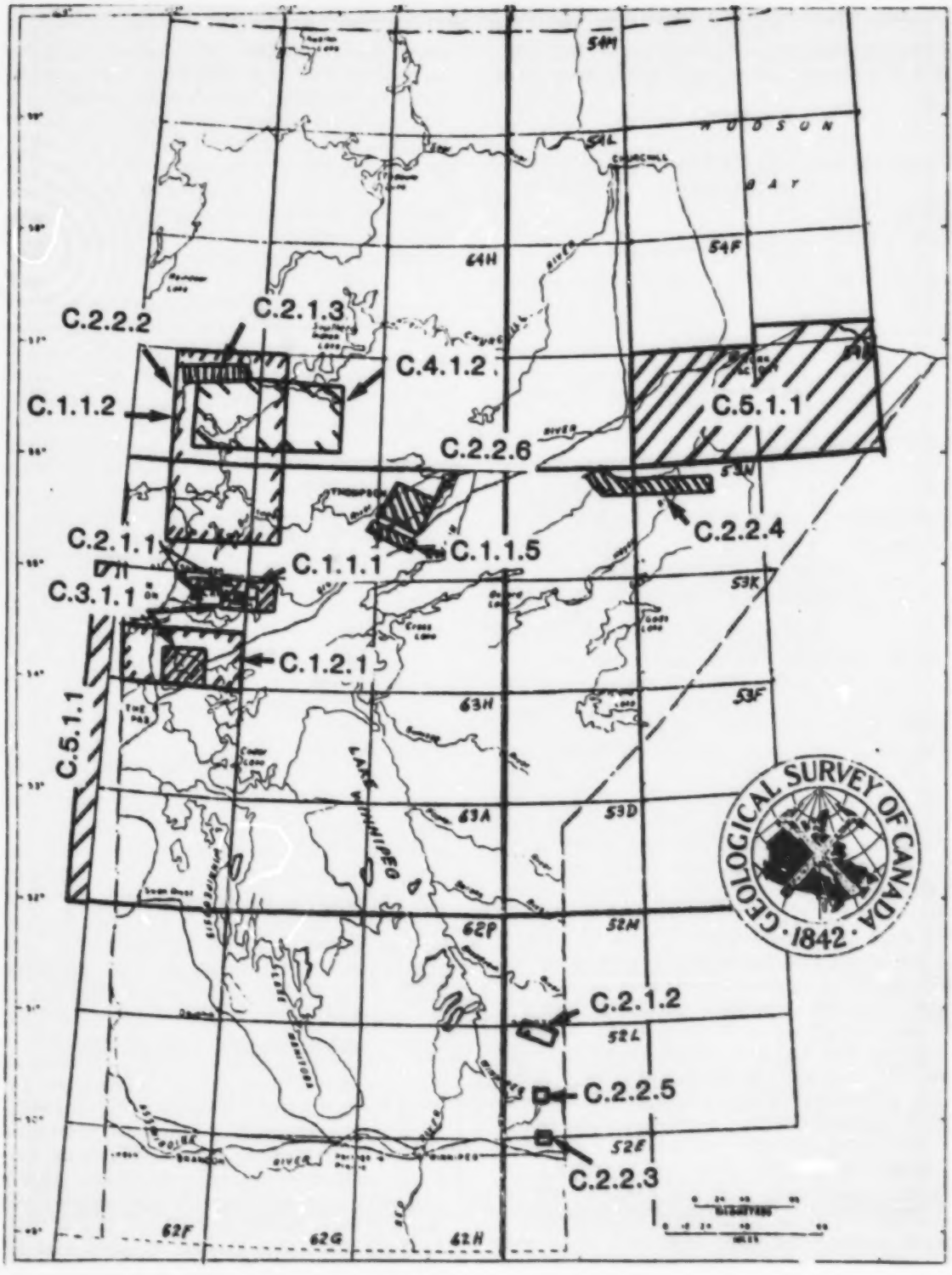
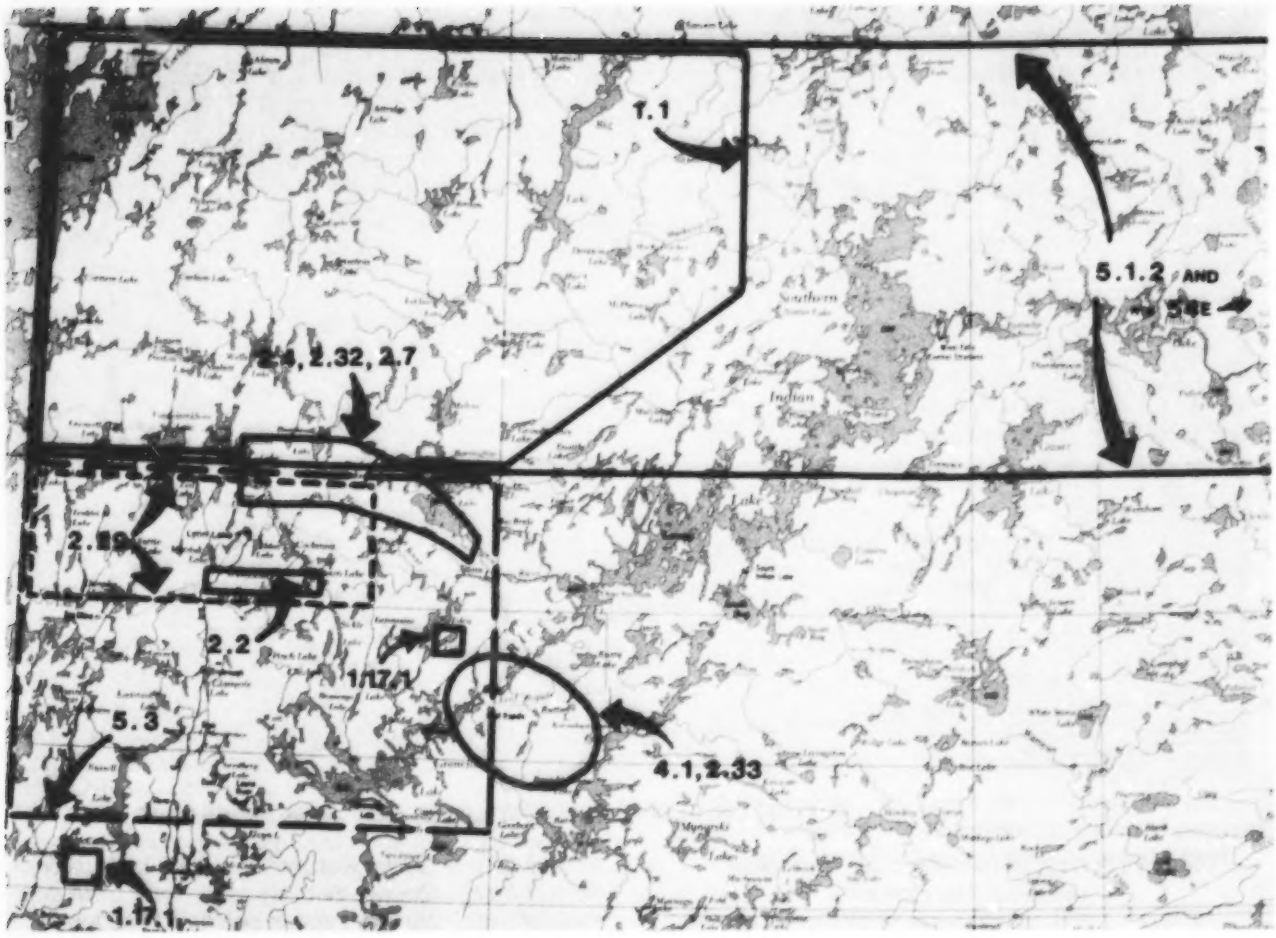


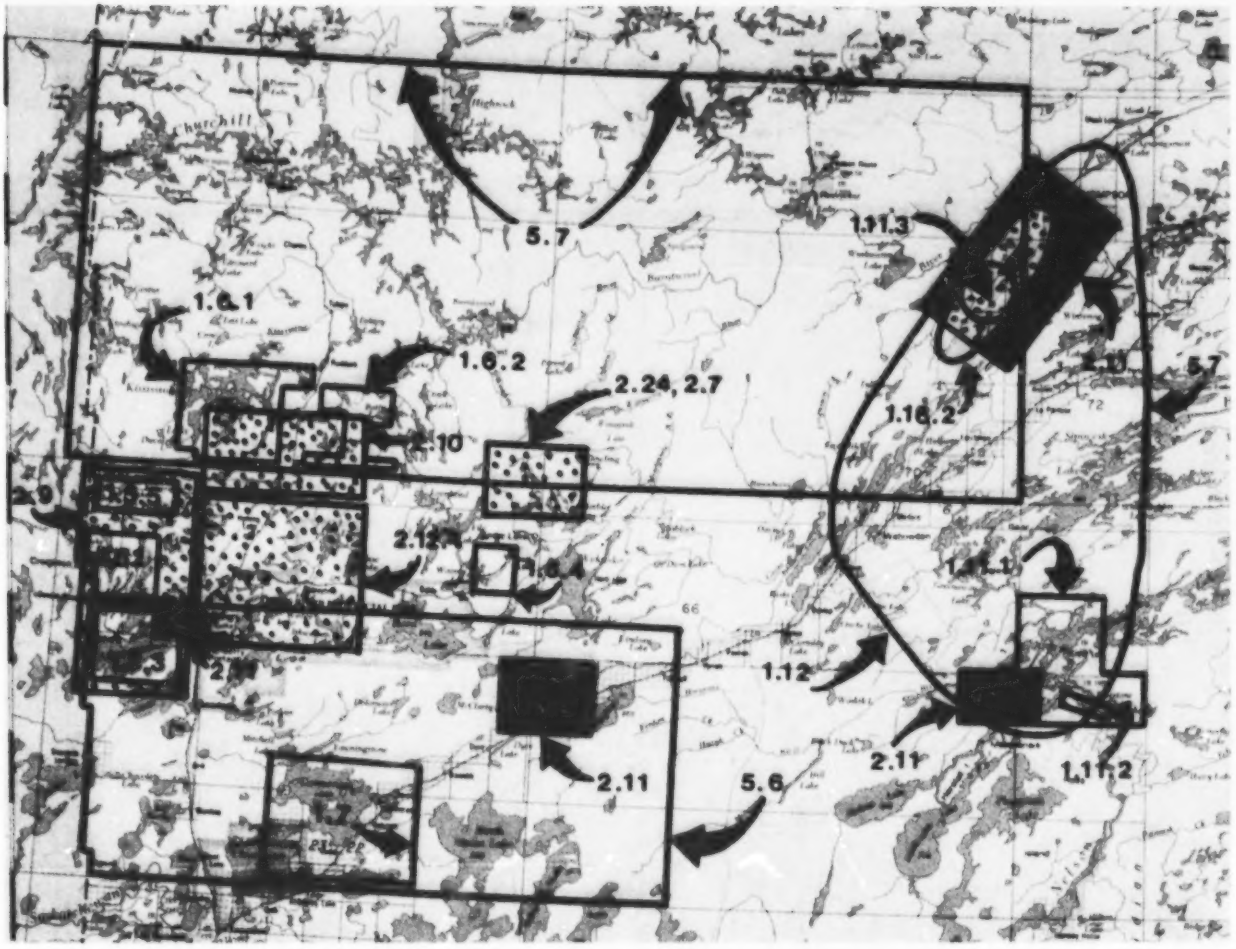
Figure 13: Location of Federal (GSC) Projects (1988/89).



DISTRICT I: LYNN LAKE-RUTTAN

Project 1.1: Geological mapping; Big Sand-Brochet Area
Project 1.1.1: U-Pb zircon geochronology, Lynn Lake
Project 1.2: U-Pb zircon geochronology, Southern Churchill
Project 1.3/1.16:Rubidium-strontium geochronology in Manitoba
Project 1.17.1: Alkali intrusions, Churchill Province
Project 2.2: Gold deposits, Johnson Shear
Project 2.4: Rock geochemistry, biogeochemistry and stratigraphy of the Agassiz Metallotect
Project 2.5: Industrial Minerals evaluation, Lynn Lake area
Project 2.27: Remote Sensing; Agassiz Metallotect
Project 2.29: Mineral deposit documentation, Ruttan-Lake area
Project 2.33: Mineral deposit documentation, Ruttan Lake area
Project 4.1: Basal till investigations, Lynn Lake-Leaf Rapids area
Project 5.1.2: 1:250 000 geological compilation, Churchill
Project 5.3: Lynn Lake reports and maps

Figure 14: Provincial Sector A projects (1988). District I Lynn Lake-Ruttan.



DISTRICT II: FLIN FLON-SNOW LAKE

Project 1.5.1/1.5.2: 1:20 000 scale geological mapping, Flin Flon area
Project 1.5.3: 1:10 000 scale geological mapping, Athapapuskow Lake area
Project 1.5.4: 1:20 000 scale geological Chisel Lake-Morgan Lake area
Project 1.5.5: Tartan Lake mapping
Project 1.6.1: 1:50 000 scale geological mapping of the Kississing Lake area
Project 1.6.2: Kisseynew East, geological mapping
Project 1.7: Scout drilling, Project Cormorant
Project 2.7: Gold deposits, Snow Lake area
Project 2.9: Mineral occurrence documentation, Flin Flon area
Project 2.10: Kisseynew sedimentary gneiss terrain
Project 2:11: Industrial minerals investigations, Flin Flon-Snow Lake region
Project 2.12.2: Geological setting, Vamp Lake deposit
Project 2.24: Copper-zinc deposits, Snow Lake area
Project 2.30: Mineral deposit geology, Flin Flon
Project 2.31: Metallogeny of felsic intrusive rocks

DISTRICT IV: THOMPSON

Project 1.11.1/1.11.2: Cross Lake, geological mapping and regional evaluation
Project 1.11.3: Thompson belt supracrustal rocks investigations
Project 1.2: Field support for U-Pb geochemistry
Project 1.15: Project management
Project 1.16: Rubidium-strontium isotope studies
Project 1.16.2: Thompson belt geochemistry
Project 2.11.1: Industrial minerals evaluation
Project 5.7: Thompson-Pikwitonei compilation

Figure 15: Provincial Sector A projects (1988). Districts II and IV Flin Flon-Snow Lake and Thompson.

George Gale will be involved in documenting the geology of mineral deposits in the Flin Flon area (2.9) in addition to preparation of Mineral Deposit Maps and Mineral Deposit files for project 2.9, and coordinating studies on the metallogeny of felsic intrusive rocks in the Flin Flon area (2.12.4), geology of the Tartan Lake gold deposit (2.12.3), Pb-Zn potential in Paleozoic rock in Manitoba (2.21) and rare-element enriched pegmatites (2.20). Richard Gunter will conclude the evaluation of industrial mineral deposits in the Thompson, Snow Lake and Flin Flon areas (2.11).

SOUTHEAST MANITOBA (DISTRICT 3)

GEOLOGICAL SERVICES BRANCH:

In SOUTHEAST MANITOBA, Werner Weber will initiate 1:10 000 scale mapping in the Rice Lake area. (1.8) Cathy McGregor, Hugh McCabe and Dorne Kowerchuk will undertake synoptic geological compilations in NTS 62I, 62H (5.8.1) in S.E. Manitoba. Peter Theyer will prepare Mineral Deposit maps and Mineral Index Files for the Rice Lake metavolcanic belt (2.14) together with reports on selected mineral deposits in the Rice Lake belt and platinum group elements in the Bird River Sill (2.17). Barbara Schmidtke will continue and finalize mapping and sampling of potential dimension stone resources in the southeast Superior Province of Manitoba (2.28).

THOMPSON (DISTRICT 4)

GEOLOGICAL SERVICES BRANCH:

In the THOMPSON district Tim Corkery, Paul Lenton and Malcolm Cameron will complete 1:10 000 mapping in the Cross Lake-Pipestone Lake area and evaluation of potential for V, Ti, and precious metal mineralization of the associated gabbroic rocks (1.11.1, 1.11.2). Josef Macek will continue detailed lithologic mapping of the Thompson belt supracrustal rocks, i.e. Pipe Pit area (1.11.3). N. Machado, L. Heaman and D. Davis from the Royal Ontario Museum in cooperation with Werner Weber and Tim Corkery will undertake U-Pb geochronology studies in the Thompson belt and Cross Lake area (1.12). Norm Halden, University of Manitoba will complete geochemical study on mafic rocks of the Thompson belt - Split Lake block and Fox River belt (1.16.2).

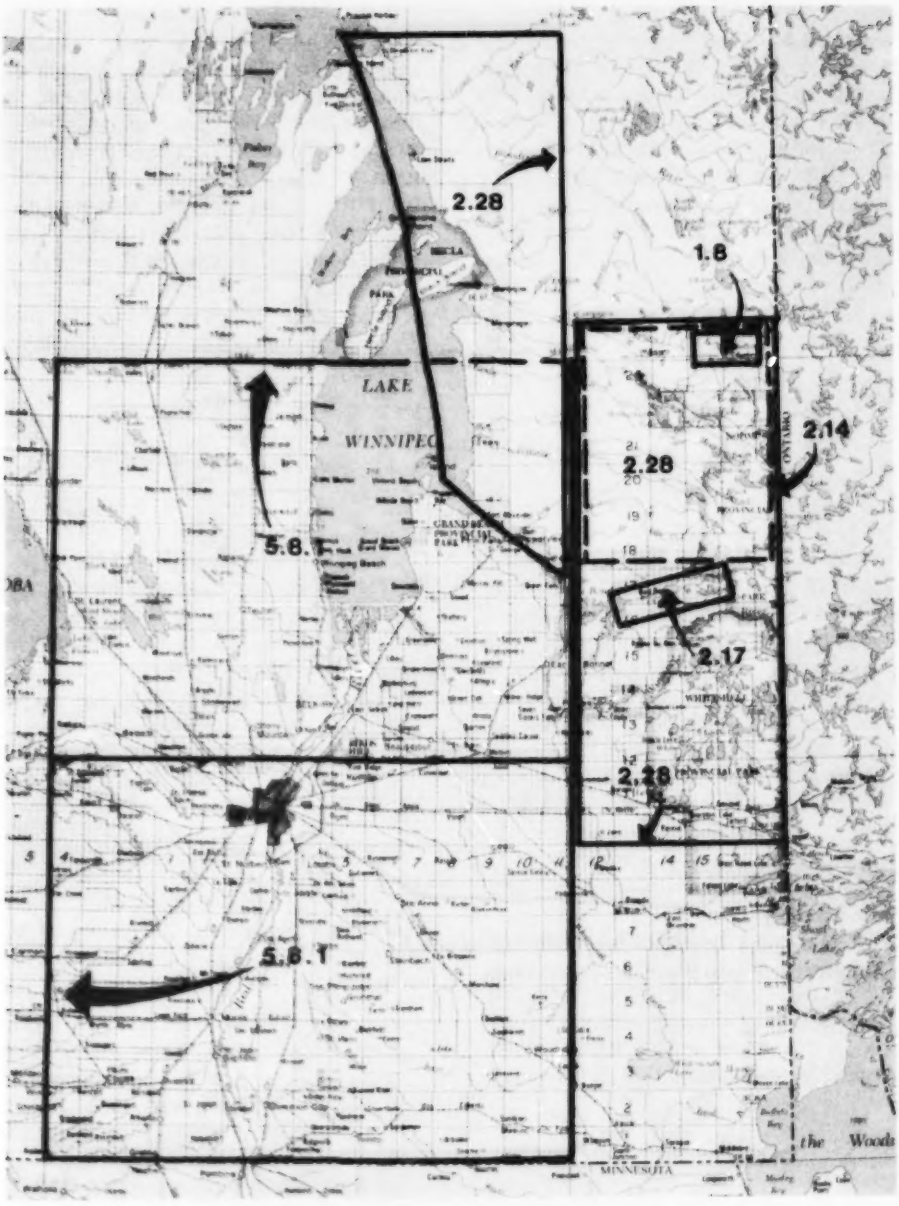
ISLAND LAKE-GODS LAKE (DISTRICT 5)

GEOLOGICAL SERVICES BRANCH:

In District 5 ISLAND LAKE-GODS LAKE AREA Paul Gilbert and Werner Weber will continue analyses and evaluation of field and laboratory data from the Island Lake area for preparation of a final report and maps of this area (1.14). Werner Weber and Dorne Kowerchuk will compile geological data of NTS 53M for preparation of a 1:250 000 scale synoptic compilation map (5.8).

PRECAMBRIAN RESEARCH AGREEMENT

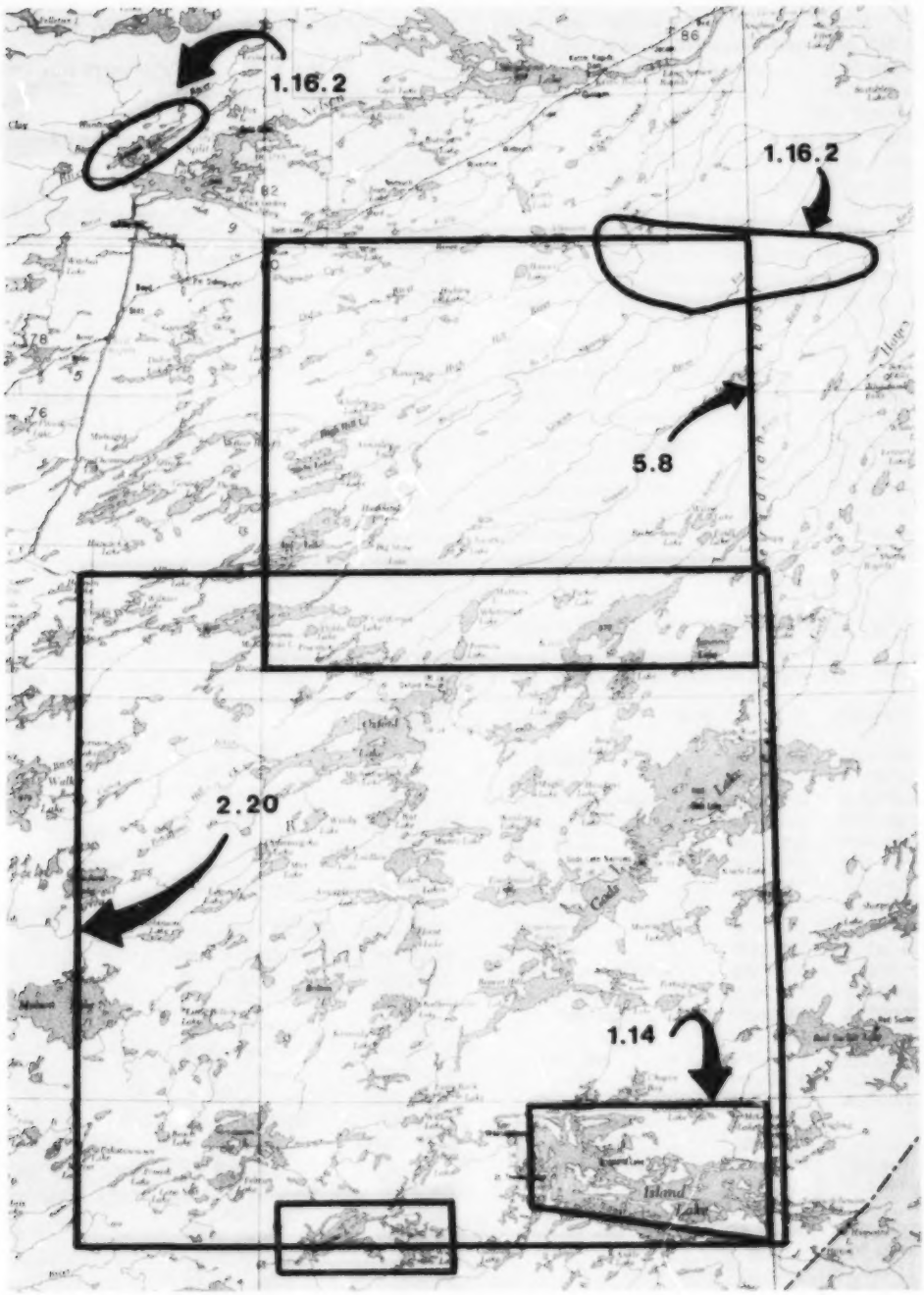
Petr Cerny and associates from the Department of Geological Sciences, University of Manitoba will complete investigations of rare-element enriched pegmatite in the Magill, Red Sucker and Red Cross Lake area.



DISTRICT III: SOUTHEAST MANITOBA

Project 1.8: Rice Lake geological mapping
Project 2.14: Mineral occurrence documentation, Rice Lake greenstone belt
Project 2.15: Genesis of the Gatlan and related gold occurrences, Wallace Lake
Project 2.17: Platinum group element potential, Bird River area
Project 2.28: Dimension stone resource assessment
Project 4.1.1: Overburden investigations in the Manigotagan-English Brook area
Geological compilations (1:250 000) NTS areas 62I, 62H.

Figure 16: Provincial Sector A projects (1988). District III: Southeast Manitoba.



DISTRICT V: GODS-ISLAND LAKES REGION

Project 1.19: Bigstone Lake-Ponask Lake mapping (U-Pb studies)
Project 2.20: Rare element enriched pegmatite evaluation
Project 5.8: 1:250 000 geological compilation, Gods Lake

Figure 17: Provincial Sector A projects (1988). District V: Gods-Island Lakes region.

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*Involved in delivery of Sector A activities.